BBRC

Bioscience Biotechnology Research Communications

Special Issue in Communication and Information Technology

Recent Trends in Computing and Communication Technology

An International Peer Reviewed Open Access Journal For Rapid Publication

SOCIETY
FOR SCIENCE AND NATURE
SCIENCE FOR LIFE

9 770974 645002

Special Issue in Communication and Information Technology

Recent Trends in Computing and Communication Technology

Guest Editors

Dr. N. Sivakumaran, Ph.D
Professor of Instrumentation and Control Engineering,
National Institute of Technology, Tiruchirappalli,
Tamil Nadu, India
nsk@nitt.edu

Dr. J. Arputha Vijaya Selvi, Ph.D
Professor & Principal of Kings College of Engineering,
Punalkulam, Thanjavur, Tamil Nadu, India
dean@kingsindia.net

and

Dr. K. Vinoth Kumar, Ph.D
Associate Professor of Electronics and Communication
Engineering, Karpagam Institute of Technology,
Coimbatore, Tamil Nadu, India
vinodkumaran87@gmail.com

SOCIETY
FOR SCIENCE AND NATURE
SCIENCE FOR LIFE

Recent Trends in Computing and Communication Technology

Editors Communication

This special issue of Bioscience Biotechnology Research Communications Vol 12 No (2) March, 2019 on "Recent Trends in Computing and Communication Technology" aims to provide a collectionof original research articles from scholars, researchers, academia and industry on the emerging problems in areas of Signal Processing, Wireless Sensor Networks, Image Processing and Cryptography.

This special Issue contains 26 articles on topics of recent trends in Computing and Communication Technology. Some of the important research discussions are Text to Speech Synthesis, Image Forgery Detection, Decision Tree Algorithm for Adhoc Network, Secure Storage in AWS-MySQL, Ring Fractal Antenna for UWB Applications, Patient monitoring system, Fingerprint Authentication, Public Transport Assistance System for Visually Challenged, Video Steganography based on DWT, Medical Image Compression and Blood Cancer Revelation System using Rasberry Pi.

All submissions are supported by proof for the technical solutions, with the experimental and simulated comparison designs and implementations. Hope the research problems and solutions discussed in this special issue would be helpful for the researchers working in these new emerging technology based areas.

Happy Reading!

Editors

Dr. N. Sivakumaran, Ph.D
Dr. J. Arputha Vijaya Selvi, Ph.D
Dr. K. Vinoth Kumar, Ph.D

CONTENTS

BBRC
Bioscience Biotechnology
Research Communications

SPECIAL ISSUE • VOL 12 NO 2 • MARCH 2019

BBRC
Bioscience Biotechnology
Research Communications

Sentiment Analysis for Expressive Text to Speech Synthesis System Using Different Techniques for Tamil Language

J. Sangeetha[1]*, B. Sudhakar[2] and R. Venkatesan[3]

[1,3]*Department of Information Technology, School of Computing, SASTRA Deemed University, Thanjavur, Tamilnadu, India*
[2]*Department of Electronics and Communication Engineering, Annamalai University, Chidambaram, Tamilnadu, India*

ABSTRACT

This paper describes a Hidden Markov Model (HMM) based (TTS) and prosody based (TTS) system for the production of vernacular Tamil Speech. The (HMM) based system contains two phases such as training and synthesis. Tamil speech is first parameterized into spectral and excitation features using Glottal Inverse Filtering (GIF). An emotions present in the input text is modeled depends on the parametric features. The performance measure has been carried out with recorded speech and the (HMM) based (TTS) system. Finally the performance of (HMM) based (TTS) has been compared with different techniques such as the (CSS) based (TTS) approach, prosody based (TTS), TD-PSOLA based (TTS) technique and (FNN) based (TTS) systems to measure the effectiveness of the system. All (TTS) systems are used to analyze the emotions such as Happy, Fear, Neutral and Sad to improve the effectiveness of the system.

KEY WORDS: HIDDEN MARKOV MODEL (HMM), GLOTTAL INVERSE FILTERING (GIF), TEXT- TO- SPEECH (TTS), CONCATENATIVE SYLLABLE BASED SYNTHESIS (CSS),TIME DOMAIN PITCH SYNCHRONOUS OVER LAP ADD (TD-PSOLA), FUZZY NEURAL NETWORK (FNN)

1

INTRODUCTION

The (HMM) is a successful technique for design the acoustics of speech and it has enabled considerable improvement in speech and language technologies (DoNovan et al.1999; Jurafsky et al. 2000). It is a statistical model used more often for speech synthesis. A basic block diagram of HMM based speech synthesis consists of training and synthesis phase. In the training phase speech signal is parameterized into excitation and spectral features. The HMM is trained using these features. In the synthesis phase, given text is transformed into a sequence of context dependent phoneme labels. Based on the label sequence, a sentence HMM is constructed by concatenating context-dependent HMMs. From the sentence HMM, spectral and excitation parameter sequences are obtained. HMM based speech synthesis has a lot of smart features such as complete data driven voice building, flexible voice quality control, and speaker adaptation. The major advantage of HMM based speech synthesizers is their higher parametric flexibility (Oshimura et al. 2000; Changak et al. 2011).

It is also used to transform voice characteristics, e.g. specific voice qualities and basic emotions. The main characteristics of these systems are High-quality speech and robustness to variations in speech quality. Speaking styles and emotions can be synthesized using a small amount of data. These characteristics make this technique very attractive, especially for applications which expect variability in the type of voice and a small memory footprint (Francisco et al. 2012; Jayasankar et al. 2014 Vibavi et al. 2015).

The naturalness of the CSS based TTS output is evaluated through the comparative performance analysis with respect to the recorded human speech in the noise free environment.The effectivness of the CSS based TTS output is estimated through the comparative performance analysis with respect to the recorded human speech in the noise free environment, (Recasens et al. 2018).

Prosody refers to the characteristics of speech that make sentences flow in a perceptually natural, intelligible manner. Without these features, speech would sound like a reading of a list of words. The major components of prosody that can be recognized perceptually are fluctuations in the pitch, loudness of the speaker, length of syllables, and strength of the voice. These perceptual qualities are a result of variations in the acoustical parameters of fundamental frequency (F0), intensity (amplitude), phonemic duration, and amplitude dynamics. The pitch and duration play an important role to improve the naturalness of TTS output. The naturalness of the prosody based TTS output is computed through the comparative performance analysis with respect to the recorded human speech in the noise free environment.

The prosody features are combined with TD-PSOLA concatenative technique to smooth and adjust the extreme units of the TTS system. In this system, the speech signal is examined as a series of pitch synchronous short term (ST) signals. These short term signals are then customized, either in the spectral domain or in the the time, in order to find a chain of artificial ST-signals synchronized with a customized pitch contour. Lastly the synthetic speech is attained by overlapped accumulation of the synthetic ST-signal. The preciousness of the TD-PSOLA based TTS output is evaluated through the comparative performance analysis with respect to the recorded human speech in the noise free environment.

Based on the emotions, FNN uses a set of fuzzy rules to classify the sentences to identify the respective emotions. The drawbacks of neural network has been eliminated by FNN incorporated in TTS system. It assigns specific labels for different emotions. Then the suitable emotion based speech output has been generated from the system. The naturalness of the FNN based TTS output is evaluated through the omparative performance analysis with respect to the recorded human speech in the noise free environment.

MATERIAL AND METHODS

PROPOSED TTS METHODS

A. Hmm based TTS method

The proposed Hidden markov model based Tamil synthesis system aims to construct innate sounding synthesized speech capable of having various sentiments.To attain this objective, the work of true human voice making device is designed by using GIF or Glottal source modeling entrenched in an HMM framework (Sangaransing et al. 2015; Natarajan et al. 2015; Jayasankar et al. 2011).

The motivations to use glottal source modeling in HMM-based speech synthesis are reduce business of synthetic speech,better modeling of prosodic aspects which are related to the glottal source and control over glottal source parameters to improve voice transformations.

B. Parameterization phase

In parameterization stage, the signal is passed through the high pass filter to reduce the low frequency fluctuation. Then windowing is carried out with 25ms frames at 5ms rectangular window. The log energy is extracted from the windowed flag.At that time speech organ opposite separating is accomplished to appraise the speech organ volume speed from the sound flag. unvaried adaptive Inverse Filtering (IAIF) is employed for the programmed GIF (Tokuda et al. 2013; Vibavi et al. 2015). It iteratively pulls back the impacts of the vocal

Figure 1. A basic block diagram of HMM based speech synthesis
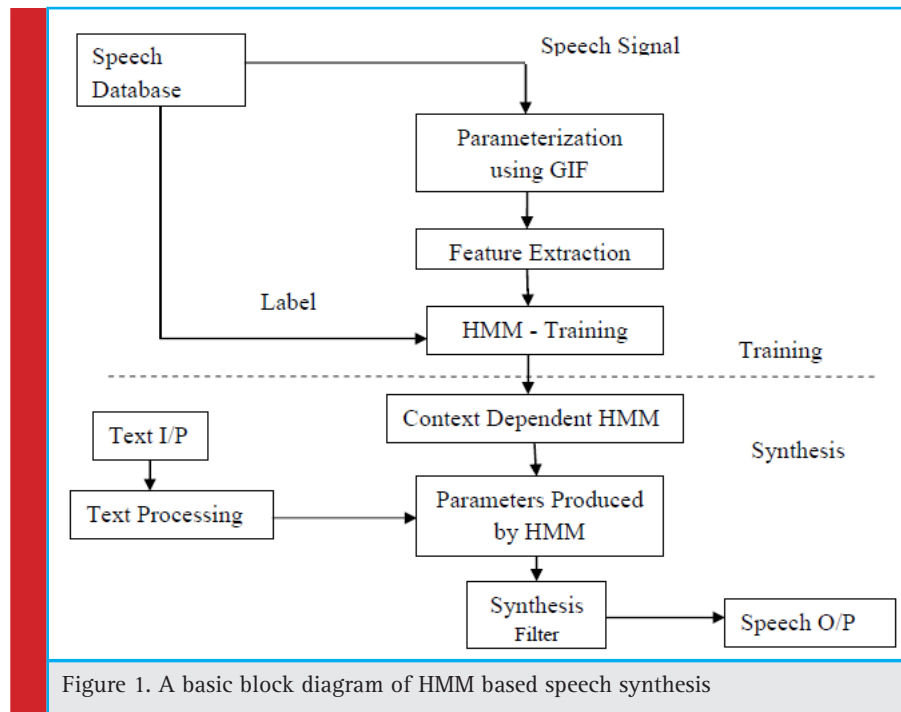
tract and therefore the lip radiation from the discourse flag, utilizing all-post demonstrating.The proposed work consist of of two main parts: training phase and synthesis phase shown in Fig 1. In the training phase, spectral parameters, namely, Mel Cepstral coefficients and their dynamic features, the excitation parameters, namely, the log fundamental frequency (F0) and its dynamic features, are extracted from the speech data using (GIF).

The HMM is trained using these features. In the synthesis phase, first, an arbitrarily given text is altered into a series of context oriented phoneme labels. Depending on the label sequence, a sentence HMM is created by merging context-dependent HMM. From the sentence HMM, spectral and excitation parameter sequences are obtained based on the Mel Log criterion. The context-dependent phone models are used to capture the phonetic and prosody co-articulation phenomena. Finally, vocoder speech is synthesized from the generated spectral and excitation parameter sequences by concatenating context-dependent HMM. It is used to analyze the emotions such as Happy, Fear, Neutral and Sad to measure the effectiveness of the system.To measure the effectiveness of the system the comparative analysis had been carriedout for HMM with prosody feature modification technique by using the similer emotions (Sudhakar et al.2016).

C. Concatenative speech synthesis system method

Text analysis

The concatenative based TTS mostly union framework. In content examination, the first stage is content standardization, discharge of accentuations, maybe, double-quotes, full stop(s) and comma(s). Associate in nursing pure sentence is integrated towards the top of content analysis. At that time all of the abbreviations introduced within the info content area unit extended and moreover undesirable accentuations like (:,; $) so forth area unit erased to avoid confusedness and to not provide any aggravation within the natural nature of the discourse. the subsequent stage in content standardization is normalizing nonstandard words like shortened forms and numbers. subsequent stage within the content examination is sentence half. during this stage, the given section is isolated into sentences. From these sentences the words area unit isolated out.

The last stage is Romanization that is that the portrayal of composed words with a roman letter set. during this framework Romanized style of Tamil word or syllables area unit created.

Speech corpus

Development of a discourse corpus for Tamil dialects may be a rather more hard endeavor than that of English discourse corpus. delivery knowledge, maybe, pitch, length and sound forecast should be done throughout the corpus building time. further filtering is also done when the corpus is made. The issue, maybe, error, untranscribed discourse units, categorical limit discovery, delivery variations ar to be distinguished and cared-for. For corpus creation single individual is used for cryptography these essential units and build discourse corpus. The discourse
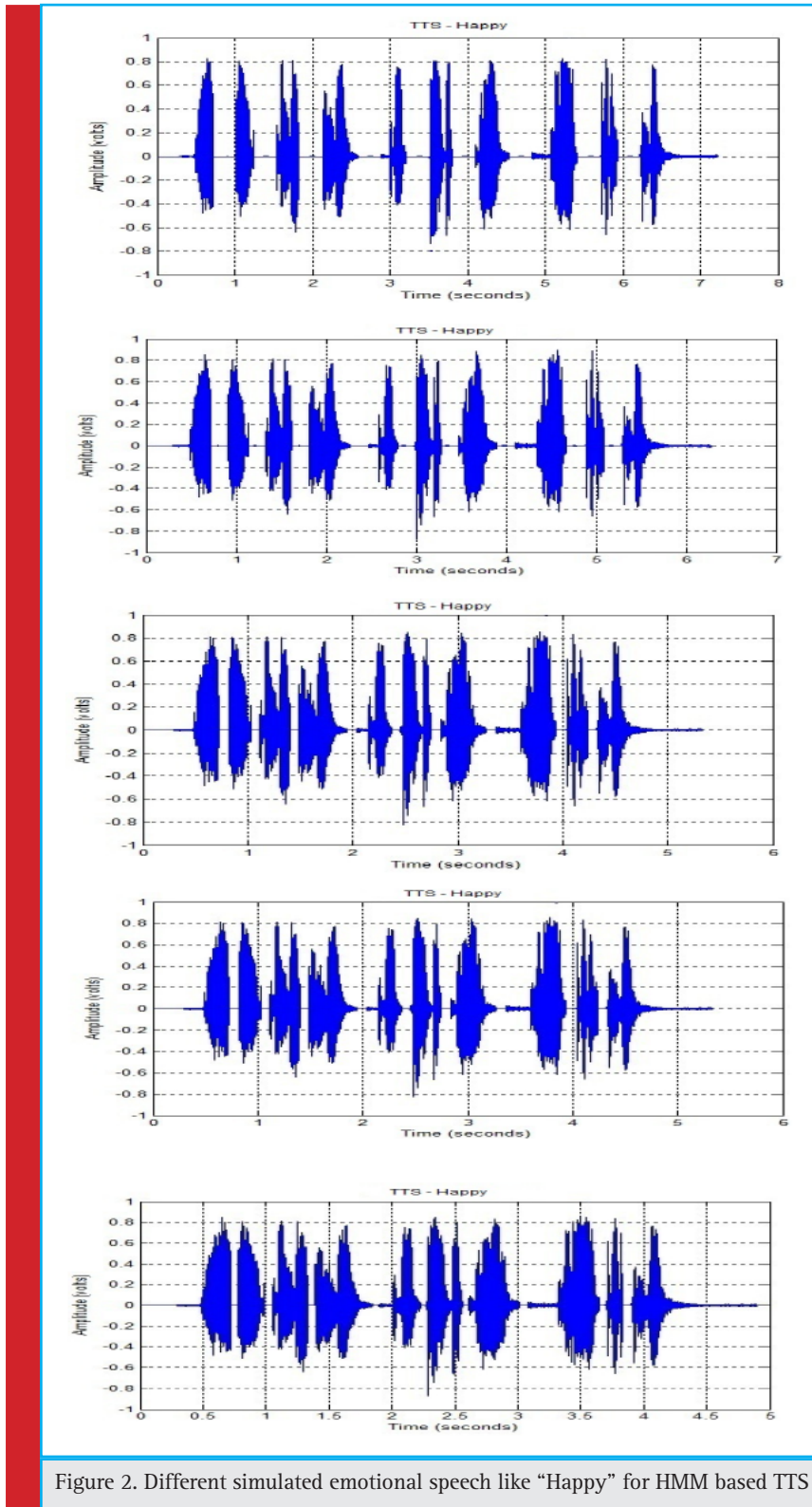
Figure 2. Different simulated emotional speech like "Happy" for HMM based TTS

wave records ar spared by the need. The discourse wave records about the Tamil words ar labled by their Romanized names. The words gathered involves lexicon words, unremarkably utilised words, Tamil daily papers and story, books, sports, news, writing and instruction for construction unrestrained TTS framework.

Waveform concatenation

In the last phase of the link procedure, the mandatory syllables are recovered from the corpus in view of the content examination and organized to create the discourse. At that point all the masterminded discourse units are connected utilizing a link calculation. The primary issue in connection process is that there will be abnormalities among the joints. These are expelled in the waveform smoothening stage. The connection procedure joins all the discourse records which are given as a yield of the unit determination process and afterward making in to a solitary discourse document.

Spectral smoothing

The time scale adjustment is completed for every syllable to create singular smoothness for syllable in Tamil TTS. The time scale alteration is utilized to change the pitch, an incentive for Tamil syllable. At that point the length esteem for every syllable ought to be computed. Smoothing at link joints are performed utilizing Linear Predictive Coding (LPC). It is utilized for speaking to the unearthly envelope of an advanced flag of discourse utilizing the data of a direct prescient model. It is a standout amongst the most effective strategies for encoding upgraded excellence discourse at a low piece rate and gives to a great degree precise assessments of discourse highlights. At long last the enhanced quality discourse for the given information content is produced. It can be played and ceased anyplace required. The primary point of the proposed conspire is to accomplish great instinctive nature in yield discourse.

D. TTS system using prosody features method

This (TTS) framework is constructed as two portions as front end and a back end. The front end has two notable assignments. The front end relegates phonetic translations to each word, and partitions and represents the content into prosodic units, similar to expressions, conditions, and sentences. The way toward doling out phonetic interpretations to words is called content to-phoneme transformation. Phonetic transcriptions and prosody data together make up the emblematic semantic portrayal that is yield by the front end. The back end frequently alluded to as the synthesizer at that point changes over the symbolic etymological interpretation into sound, (Huang et al. 2013; Toma1 et al. 2010 Sangeetha et al. 2017).

It presents a TTS synthesis system using prosody features like pitch, pause, stress, phoneme duration, etc.,. First the incoming text must be accurately converted to its phonemic and stress level representations. This includes determination of word boundaries, syllabic boundaries, syllabic accents, and phoneme boundaries. The text preprocessing finds the word boundaries. Subsequently the prosodic parsing involves the determination of phrase boundaries and phrase level accents. Then the system produced appropriate emotions for the text input. Finally concatenation is carried out to produce the synthesized speech output.

E. TTS system using TD–PSOLA method

It is a notably utilised concatenative synthesis method to create the precious speech signal. The vital aspire of TD-PSOLA method is to modify the pitch directly on the speech waveform (Trilla et al. 2013; Trueba et al. 2015). The TD-PSOLA procedure consecutively used three sequential steps, namel yi) pitch synchronization, ii) pitch synchronization modification and iii) pitch synchronization synthesis. Pitch synchronization showes an vital role on TD- PSOLA method, first one is fundamental frequency detection and second stage is pitch mark.

Let $X_n(m)$ represents the short time signal windowed sequence

$$X_n(m)=h_n(t_n-m)y(m) \tag{3}$$

where t_n is the mark point of pitch, h_n is the window sequence. Pitch synchronization alteration links the pitch mark by changing the duration (insert or delete the sequence with the length of pitch duration) and tone (increase or decrease the fundamental frequency). The pitch synchronization synthesis adds the novel sequence signal formed in the earlier footstep.

$$X(m)=\frac{\sum b_j x_j(m)h_j(t_j-m)}{\sum h_j^2(t_j-m)}$$

Table 1. Amplitude variation and spectral mismatch of recorded speech												
Emotions	Recorded Speech		CSS		Prosody Parsing		TD-PSOLA		FNN		HMM	
	Amp (volts)	SM (secs)	Amp (volts)	SM (secs)	Amp (volts)	SM (secs)	Amp (volts)	SM (secs)	Amp (volts)	SM (secs)	Amp (volts)	SM (secs)
HAPPY	0.95	0	0.84	0.39	0.864	0.28	0.881	0.19	0.893	0.12	0.924	0.042
FEAR	0.92	0	0.83	0.43	0.842	0.37	0.863	0.28	0.871	0.16	0.892	0.063
NEUTRAL	0.85	0	0.75	0.46	0.765	0.40	0.782	0.35	0.772	0.24	0.813	0.14
SAD	0.79	0	0.64	0.49	0.67	0.43	0.693	0.38	0.714	0.32	0.752	0.19

where t_j is the new pitch mark, h_j is the synthesized window sequence, b_j is the weight to compensate the energy loss when modifying the pitch value. The prosody generator received the Tamil text input contents. The prosody generator distribute the duration of each phoneme and the pitch contour.

Initialy the input is transformed into phonemes depends on the key stokes concerned in the font there in the input. A database containing the keywords and category of emotion to which it belong. The text is scanned and the keywords present in the text are the duration and pitch of each phoneme based on the content and context of the text.

F. FNN based TTS method

The proposed TTS system based on FNN to generate the speech output of various emotions. The lexical analyzer is utilized for changing over the simple text into separate units is known as tokens. These tokens are uttered in normal patterns as recognized by the grammar of the language.

ANTLR (Another Tool for Language Recognition) is an intense parser producer utilized as a part of this system for perusing, handling, executing, or deciphering organized content or binary files. Also it is utilized to decide the content words, refusal words.It is also utilised for sifting the end words in the sentences and to eliminate punctuations and special characters in the sentences.

The sentence splitter divides the entire document into sentences and paragraphs. It utilizes the binary decision for restricting the sentences. Generally upper case letters, periods, question marks and exclamation points are good signs of sentence limits. The denotation of the emotional words (i.e verbs, nouns and adjectives) resolved by sense disambiguator according to their context. It make use of the semantic similarity measure to attain the senses of an emotional word with the background words. Depends on the sentimental attributes the classifier mark remarkable notation to each input text with appropriate emotion. Formatter presents the results in a usable form. Then it is given as input to the phonetic analysis. Tamil language rules are imposed to translate the text to sound waves.

Using a phonetic alphabet Phonetic analysis is utilized to convert the orthographical signs into phonological. The ASCII format text into the sound waves are transulated using grapheme to phoneme transulater. For transulate the Tamil phonetic format syntax and Letter To Sound (LTS) rules have been used. The mixture of stress pattern, rhythm and intonation in a speech is called as prosody. To explain the speaker's sentiment from end to end pitch variations the prosodic design is mostly used. A deviation of speech while speaking is called Intonation. Ultimately concatenation is performed to create the synthesized speech.

RESULTS AND DISCUSSION

Experimental results of various method for Happy emotions are illustrated in Fig 2. The performance analysis has been carried out through compare the recorded speech with (HMM) based (TTS) system to measure the naturalness achieved in this system.

The recorded speech features are taken from Table-I which are used as the reference for analyze the performance of this system. Table-I shows the amplitude variation and spectral mismatch of recorded speech which is used as the reference to messure the performance of the TTS systems.Because the spectral mismatch is zero it will produce the speech output similar to the natural voice.A highest spectrul mismatch hase been produced in CSS based TTS when compare with the remining methods. Hence the speech out put will not be similar to the natural voice. But the spectal mismatch is minimumin in HMM based TTS system.So the speech signal will be more enhanced in HMM based TTS system when compare with the other TTS methods.

CONCLUSION

The (HMM) based (TTS) system and (CSS) based (TTS) approach, prosody based (TTS), TD-PSOLA based (TTS) technique and (FNN) based (TTS) systems have been developed for the Tamil language. The performance analysis has been carried out for all systems to measure the naturalness achieved by the individual system. Based on this analysis the (HMM) based system produced highest naturalness than the remining TTS systems. The emotional speech has been generated by (HMM) using the parametric features of (GIF). The prosody feature allows the synthesizer to vary the pitch of voice to produce the output of (TTS) in the same form as if it is actually spoken. The emotions such as "Happy", "Fear", "Neutral" and "Sad" are analyzed to measure the effectiveness of the (HMM) based (TTS) systems. Simulation results show that the (HMM) based (TTS) system is gifted by producing precious speech quality.

REFERENCES

Changak M.B, Dharskar R.V. (2011), Emotion Extractor Based Methodology to Implement Prosody Features in Speech Synthesis, International Journal of Computer Science, Vol. 08, No. 11, pp. 371–376.

DoNovan R, Woodland.P.(1999), A Hidden Markov-Model-Based Trainable Speech Synthesizer, Computer Speech Language, Vol.13,No.3,pp.223–241.

Daniel Recasens., Clara Rodríguez. (2018), An Ultra Sound Study of Contextual and Syllabic Effects in Consonant Sequences Produced Under Heavy Articulatorty Constaint Conditions, Journal of Speech Communications, Vol. 105, No. 02, pp. 34-52.

Francisco V., Hervąs R. (2012), Emo Tales: Creating a corpus of folk tales with emotional annotations, Language Resource and Evaluation, Vol. 46, No. 03, pp. 341–381.

Huang H.E, Lech M. (2013), Emotional Speech Synthesis Based on Prosodic Feature Modification., Engineering, Vol l, No. 5, pp. 73-77.

Jurafsky D., Martin J.H. (2000), Speech and language processing, Pearson Education, India.

Jayasankar T., Thangarajan R., Arputha Vijayaselvi J. (2011), Automatic Continuous Speech Segmentation to Improve Tamil Text-to-Speech Synthesis, International Journal of Computer, Vol. 25, No. 1, pp. 31-36.

Jayasankar T., Arputha Vijayaselvi J., Balaji Ganesh A., Kumar D. (2014), Word and Syllable Based Concatenative Model of Text to Speech Synthesis of Tamil Language,International Journal of Applied Engineering Research, Vol. 9, No. 24, pp. 23955-23966.

Natarajan V.A., Jothilakshmi S. (2015), Segmentation of Continuous Tamil Speech Into Syllable Like Units, Indian Journal of Science and Technology, Vol. 08, No.17, pp. 417–429

Oshimura T., Kitamura T.S. (2000), Simultaneous Modeling of Spectrum Pitch and Duration in HMM-Based Speech Synthesis, IEICE Transactions, pp. 2099–2107.

Sangaransing K., Monica M. (2015), A Marathi HMM Based Speech Synthesys System, Journal of VLSI and Signal processing, Vol. 05, No. 06, pp. 34-39.

Sudhakar B., Bensraj R. (2016), Performance Analysis of Text To Speech Synthesis System Using Hmm and Prosody Features With Parsing for Tamil Language, International Research Journal of Engineering and Technology, Vol. 03, No. 6, pp. 2233-2241.

Sangeetha J., Jayasankar T. (2017), Emotion Speech Recognition Based on Adaptive Fractional Deep belief Network and Reinforcement Learning, Advances in Intelligent Systems and Computing: 167-174.

Toma1 A., Ionut G. (2010), A TD-PSOLA Based Method for Speech Synthesis and Compression, Proceedings of IEEE International Conference on Communications, 23–126.

Trilla T., Alias F. (2013), Sentence-Based Sentiment Analysis for Expressive Text-to-Speech, Proceedings of IEEE Transactions on Audio and Speech and Language Processing, 223–233.

Tokuda K., Nankaku Y. (2013), Speech Synthesis Based on Hidden Markov Models, Proceedings of IEEE, Vol. 101, No. 5, pp. 1234–1252.

Trueba J.L. (2015) Emotion Transplantation Through Adaptation in HMM-Based Speech Synthesis, Computer Speech Language processing, Vol. 34, No. 01, pp. 292-307.

Tobias L.J., Daniele G. (2016), Fast Algorithms for High Order Sparse Linear Prediction With Applications to Speech Processing, Speech communication, Vol. 76, No. 01, pp.143–156.

Vibavi R., Bharath G. (2015), Text Processing for Developing Unrestricted Tamil Text to Speech Synthesis System, Indian Journal of Science nd Technology,Vol. 08, No. 29, pp.112-124.

Vibavi R., Bharath G. (2015), Text processing for Developing Unrestricted Tamil Text to Speech Synthesis System, Indian Journal of Science and Technology, Vol. 08, No. 29, pp.112-124.

BBRC

Bioscience Biotechnology
Research Communications

A Sequential Survey on Diversified Techniques in Image Forgery Detection

B Sudhakar[1]*, S. Dhivya[2] and P. Madhavan[3]

[1,2]*Department of Electronics and Communication Engineering, Annamalai University, Chidambaram, Tamilnadu, India*
[3]*Department of CSE, SRM institute of science and technology, Kattankulathur, Tamilnadu, India*

ABSTRACT

In the today's computerized world in which all sort of progression is getting to be conceivable and in the meantime, the utilization of pictures have been growing well ordered in our lives. The inspiration to take control of pictures also increases in the meantime. This kind of picture imitation is continuing expanding step by step. As the fabrication of images is developing cyclically, it is especially important to create devices for recognition as which picture is valid and which is fraud. The examination attempts to cover included computations over late years, organize them in social events having the near procedures to deal with issues. This treatise features current issues in the imitation identification methodologies and all their relative investigation.

KEY WORDS: IMAGE PROCESSING, IMAGE FORENSICS, DIGITAL SIGNATURE, IMAGE PRE-PROCESSING, FORGERY DETECTION (FD)

INTRODUCTION

A Picture i.e. handled by a computerized PC is called as an advanced picture. It might be noticed that an advanced picture comprises of a limited number of components which are having a specific area and esteem. These components of the picture are known as picture components, picture components or pixels. Picture preparing is a strategy in which the picture is changed over into advanced shape and a few activities are preformed on it to get an improved picture or removing some essential or supportive information from it. It is a kind of planning in which the data may be the picture.

The latest imaging advancements have given falsifiers require devices for changing and utilizing the substance of advanced pictures to the point of adding a article to the pictures with no recognizable highlights. Beginning here, it is prescribed by various researchers to set up

picture valindess to perceive these activities which can be found in various applications (Lin et al. 2009).

The key normal for picture cloning is that, since the copied area is picked from the picture itself, the commotion segments, surface, and shading designs are perfect with whatever is left of the photograph. In this way, it is difficult to see the imitate parts. Also, there might be post-preparing activities that can even make the uncovering technique harder. Forgery Detection (FD) strategies turn out to be considerably more entangled to manage the most recent fraud systems. This back to the accessibility of computerized altering devices, change, and control turn out to be simple and thus imitation location turns into an intricate and undermining issue.

Picture falsification recognition can be controlled in different courses with numerous straight forward activities like relative changes. The programmed and logical technique for distinguishing the fashioned pictures has turned into a major testing issue for specialists and a similar issue is valid for each media substance. Picture Forgery is predominantly arranged into two sort active and passive approach. The methodologies are clarified in detail underneath:In this active method, the advance picture requires some sort of pre-processing. Advanced watermarking and mark are of two fundamental dynamic security procedure, as something is installed into pictures when they are gotten (Cheng et al. 2006). We can identify the Image is altered if unique data can't be separated from that gotten picture.

In passive picture, criminology is generally an extraordinary challenge in picture preparing methods. There isn't a specific technique that can treat every one of these cases, yet numerous strategies each can recognize an exceptional fraud in its claim way, (Meera et al. 2015). Neither one of the manufacturers is installed in the picture and nor related to it for security, as like special frameworks and in this way, this system is in like way known as crude picture investigation. The following are cases involved in Forgery detection, (Xiang Lin et al. 2018).

Picture Retouching, Picture interlace, Transforming, Copy-Move, Digital Watermark, Digital Signature.

MATERIAL AND METHODS

The following areas are covered in methods and techniques in FD: Highlights Extraction with No Transformation, Highlights Extraction with Transformation, Key-Point Based, Pixel Based, Intensity Based, Moment Based, VAM, SVM Classifier, and Identification through Descriptors.

A. Extraction with no transformation

The following are the classification of techniques involved with extraction with no transformation in forgery detection as shown in Fig 1.

Figure 1. Categorization of technique with no transformation
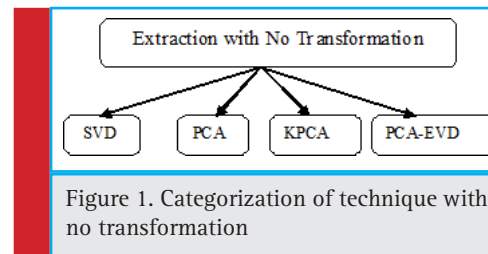
Likewise be power against modifying distinguishing by a calculation named Singular Value Decomposition (SVD) was connected to remove the arithmetic and geometric Highlights (XiaoBing Kang et al. 2008). From small covering picture squares and to make a single regard incorporate vectors which are saved in a system. This cross section is then position by diminished position estimation before checking the likeness of vectors.

They propose duplicate move falsification discovery in the advanced picture in 2010 (Kang et al. 2010). This framework is practical to perceive duplicate move bending by applying PCA. Creators segregated the image into sub-squares and used refreshed SVD. By then, closeness planning is performed on the lexicographically masterminded SV vectors and the created area in the photos is perceived.

Kernel Principle Component Analysis (KPCA) or wavelet change to expel the highlights of the little squares separated from a given picture which is the lexicographically arranged to suggest the likeness of relating squares (Amanpreet Kaur et al. 2013). What's more, a programmed procedure is effective to constrain the number of comparative matches and expels the pointless counterbalance recurrence limit. The paper proposes calculations to recognize manufactured zones with interpretation, flip, and revolution dependent on the worldwide. The outcomes likewise consider to instances of expansion clamor, lossy JPEG pressure. KPCA is the best if there should be an occurrence of loud and pack information, the pivot of any degree contrasted and PCA and wavelet based.

The proposed another technique for duplicate move fraud discovery. Their procedure begins with the change of shading picture into a grayscale picture. By at that point, they related DWT to whole picture (Zimba et al. 2011). This gives sub-get-togethers, out of which low recurrent sub-band is sufficient to the perform region process. They parceled the image into a couple of covering squares. They performed Principal component Analysis – Eigen Value Decomposition (PCA-EVD) on the squares. They processed the institutionalized move vector and a while later equalization repeat. This balance repeat is exposed to morphological dealing with to give last results. They made this technique by reducing the image gauge in the beginning of the strategy.

They included morphological assignments to avoid false revelations. The rule weakness is that the imitated zone ought to be more important than the square size, else it can't be recognized. Furthermore, their system fails to perceive fakes including scaling, turn, and considerable weight.

B. Highlights extraction with transformation

The following are the classification of techniques involved with extraction with transformations techniques to detect forgery detection as shown in Fig 2.
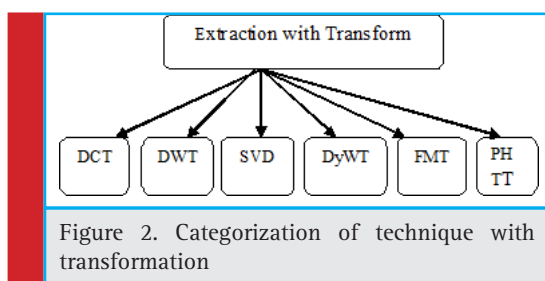
Figure 2. Categorization of technique with transformation

They have inspected the procedure quantized Discrete Cosine Transform (DCT) coefficients rather than the pixel regards (Fridrich et al. 2003). In this way, the part vectors can't avoid being vectors of quantized DCT coefficients. The quality factor in JPEG weight will choose the quantization advance for DCT change coefficients which is known as the customer showed parameter Q. The basic positions will be considered if there ought to be an event of too many planning squares.

Truth to be told, many proposed calculations to identify Copy-Move areas utilizing Discrete Wavelet Transform (DWT) instead of the pixel respects (Sutcu et al. 2007). Gotten from the rule that the sharpness qualities of locales with and without altering are unique, the estimation of sharpness on the non-covering in a picture dependent on consistency properties of wavelet change coefficients turns into another answer for recognizing the altered picture.

An examination illuminated about a generous strategy for perceiving duplicate move extraction utilizing Dyadic Wavelet Transform (DyWT). Their procedure relies upon the extraction of low repeat portion and a high repeat part; planning them by applying a closeness measure. DyWT is most commonly used in various distinguishing proof systems. Nevertheless it is moving invariant (Muhammad et al. 2011). Given an image, makers fold them using a low-pass channel and a high-pass channel. At that point, they utilized calculation to figure DyWT of that picture. Four sub-bundles are gotten at the yield side and they are of vague size from that of the fundamental picture. The makers initially decayed the offered picture to scale one by using DyWT. They uti-

lized this property to discover duplicate move deception. To discover the closeness they utilized Euclidean division framework. They found the Euclidean separation for both LL1 and HH1 and plugging demand separately. They differentiated the characteristics and a preset edge regard.

If the characteristics come up short with respect to the edge regard then they discarded those characteristics. If they are seen to be comparable then they saw those characteristics as addressing the fabricated zone. Their procedure is superior to anything a couple of various systems and gives better results. At any rate the image must be changed over into grayscale before dealing with.

Fourier-Mellin Transform (FMT) was introduced as a helpful and excited philosophy for perceiving duplicate move performing at an overall amassing on acoustics, talk, and pennant managing (Sevinc Bayram et al. 2009). This paper used FMT to remove the features which are useful to lossy JPEG weight, darkening, progression and invariant to translation, scale and slight spurn small covering squares in the photo. These features by then apply lexicographical dealing with to get the dynamic squares with close features. The count is associated with pictures controlled by elucidation.

A recent study depicts a square coordinating strategy for duplicate move imitation discovery by utilizing PHT (Polar Harmonic Transform). They utilized this new sort of symmetrical minute to produce highlights of squares and they achieved coordinating utilizing PHT highlights (Wang et al. 2012). They utilized this method to discover duplicate move imitations which include square turns and geometric changes. PHT calculation is great in distinguishing duplicate move phonies wherein the glued region is turned before being stuck. All other customary discoveries are expert well. Their calculation is better than numerous other proposed strategies in an ordinary location. Be that as it may, it isn't great in recognizing fabrications including scaling and nearby bowing.

Key point based calculation in the writing generally requires two stages for identifying and portraying nearby visual highlights. In the initial step limitation of the intrigue point is finished. In the second step the development of the vigorous nearby descriptors is finished. The following are the classification of techniques involved with transformations techniques to detect forgery detections.

A study on duplicate move fabrication recognition by utilizing SURF (Speeded-up Robust Features) (Junwen et al. 2010). It includes key point recognition and depiction. They utilized a Hessian framework for recognizing the key points and Haar wavelets for allotting the introduction. By weighting the reactions with Haar wavelets, they expanded the strength to limitation mistakes and geometric distortions. They picked Haar wavelets

since they are invariant to the enlightenment inclination. They utilized an edge to build the power and evade false identifications. They picked an observational estimation of edge and tried their calculation. They utilized the calculation to test and were powerful in exhibiting its quality for post handling is done on the picture. It is vigorous and speeds in recognizing. They couldn't locate the correct limits of the altered locale.

The achievement of distinguishing a controlled picture in which the reproduced zone is turned with emotional focuses Hailing Huang et al. 2008). This framework isolates key focuses which are invariant to changes in the zone, picture using Scale Invariant Transform (SIFT) estimation including 4 stages: Scale-space extraordinary acknowledgment, key point imprisonment, presentation undertaking, and key point descriptors. The higher edge regard is, the more false organizing is obtained. A sensible limit and examining system for key focuses organizing are associated. This gives extraordinary execution on post taking care of containing JPEG weight, scaling, and compound picture getting ready and will be improved to apply to low SNR and minimal size changed zone.

At the point when geometrical change and distortion occurs in altered locales, every single past strategy indicates poor execution (Atefeh Shahroudnejad et al. 2016). To take care of this issue, ASIFT (Affine Scale Invariant Feature Transform) calculation has been proposed to extricate more strong highlights which can decide existing duplicate move areas even under these complex varieties.

Pixel-built systems supplement as for the pixel of the propelled picture (Farid et al. 2009). These strategies are commonly asked for into 3 categories. For instance, cloning, Re-testing, and joining. We are centering just two sorts of techniques copy move and uniting in this paper. This is the most typical picture control technique among the exceptional misrepresentation conspicuous evidence systems.

This is the most well-known sort of picture phony and this is otherwise called duplicate move, fabrication. In the duplicate move a piece of the picture is reordered elsewhere inside the picture. For making a composite of two people it might be possible that one individual might be resized, stretched out to support the general stature of different people. So this technique needs to resample striking picture into another reviewing cross-segment. In this system, computerized joining of at least two pictures is done into a solitary composite picture. Assume we have two pictures the two pictures are grafted into a solitary composite picture. At the point when performed painstakingly, the fringe between the grafted areas can be outwardly barely recognizable.

The following are the techniques involved with intensity based in order to detect forgery detection. They

displayed another strategy for duplicate move fabrication discovery. They performed Quantization Coefficients Decomposition on Discrete Cosine Transform and Discrete Wavelet Transform coefficients (Ghorbani et al. 2011). They changed over the given picture into grayscale. By then, they associated DWT in any case to get four sub-gatherings. They used only the low repeat sub-band for extortion acknowledgment. By then, they parceled an image into a couple of squares of a similar size. By then, they associated DCT to get incorporate vectors and a while later QCD is performed on these DCT vectors. These component vectors are planned into the grid. To diminish computational multifaceted design, they orchestrated the structure lexicographically.

A limit regard is set for the count regard and the squares are set to be formed just if the count regard outperforms this edge regard. Their procedure is capable in recognizing impersonations when stood out from various methodologies. In any case, this technique can't distinguish fabrications when the altered locale experiences post-handling like turn, scaling and substantial pressure. Additionally, this strategy forces certain limitations on the manufactured regions.

They proposed another technique for duplicate move fabrication recognition. They used a grayscale executive call Local Binary Pattern (LBP) to portray the picture surface (Li et al. 2013). They changed the given picture into grayscale and post-preparing techniques performed on the produced picture. For such pictures, high recurrence segments won't be steady. Thus, they utilized a Gaussian low pass sift. At that point, they separated the picture into a few covering round about squares. They removed the component vectors of the square utilizing LBP which is turned invariant. At that point, euclidean separation is evaluated for each element vector and is contrasted and edge esteem. They got facilitated squares are separate on the image to exhibit the assembling regions. They saw some false locales to speak to that they used isolating to diminish the false positives. At that point, they performed morphological preparing and morphological disintegration to evacuate the false positives totally. Their strategy is invariant to turn and flip. Be that as it may, their strategy can't distinguish phonies including pivot at various points. Behavior Knowledge space (BKS) check (Ferreira et al. 2016). The two frameworks are joined blocked based and key-point based and beat a harm of this two technique a creator proposed system which encodes the yield mixes of various methodology as from the earlier likelihood examining diverse sizes of the availability information, (Manojkumar et al. 2017).

A while later, the missing sections of restrictive probabilities are sincerely evaluated through generative models related on the current preparing information.

The following are the techniques involved with moment based in order to detect forgery detection. It talked about the Gaussian pyramid are utilized for however square of picture measurements and four highlights examined (Thajeel et al. 2014). The picture isolated into many settled estimated hinders that and additionally joined and afterward computed the area esteem through Hu moments.

Another answer for FD with general pivot was introduced in (Jin Ryu et al. 2010). Zernike minutes as a framework to remove the highlights from the campaigned sub-blocks in the suspicious picture. These part vectors are by then orchestrated lexicographically and the resemblance of two connecting squares is figured using Euclidian detachment and an edge to find the contender for the extortion. The Precision, Recall, and F1 measure (both Exactness and Recall) are then connected with the suspicious locale to confirm the pantomime. On account of squares with the comparative Zernike minutes, to guarantee the precision of identification, ascertaining the separation between of the real squares of a picture will be considered.

They utilized haze minute invariants to speak to picture districts since they can't be influenced by haze debasement and added substance clamor. Their strategy starts with the tilting of pictures by squares of a specific size (Mahdian et al. 2007). They spoke to each square with haze invariants. The highlight vector for each square is of length 72. These are standardized further to enhance the duplication identification capacities of the calculations.

The proposed a strategy to identify computerized picture grafting with visual prompts in 2009. The makers used a territory window and separated it into nine sub-squares (Qu et al. 2009). VAM (visual idea show up) is utilized to see an obsession point and after that segment extraction for removing the united region in the image.

SVM classifier is used for the exactness of recognizing fake is overhauled by using SVM classifier. Acknowledgment of deliver Image is done using SVM classifier on methodical preface by sketching out a clear methodology including two phases, which are arranging stage and testing stage (Kavitha et al. 2014). In the availability sort out, a database is made with various pictures. Some Pre-taking care of is done on the photos by changing over into a dull scale from RGB. By then feature extraction is done by separating pictures, their Pixel regards and surface examination. From that point onward, Hash regards are registered for the above-evacuated features. The substance and picture arrange, handwriting affirmation, and bioinformatics are generally mind boggling action and bio-progression examination, which are, all things considered, reliant on Images, are dealt with by SVM classifier.

C. Identification through descriptors

Coming up next are the through descriptors situated with the end goal to recognize phony recognition. They proposed a strategy to recognize duplicate pivot move imitation location utilizing the MROGH descriptor (Yu et. al., 2014). This paper analyzes a framework, in which screened the Harris Corner Detector and the MROGH descriptor are used to develop better section thought and power against the upheaval. It is an especially beneficial method.

They proposed a strategy to recognize duplicate move imitation dependent on manifold Weber law descriptors (WLD) (Hussain et al. 2012). The proposed multi-objectives WLD expels the features from chrominance parts, which can give more information that the human eyes can't take note.

CONCLUSION

With progression in the picture preparing innovation, forgery discovery technique is all the more requesting in our general public. The recognizable proof of computerized picture fraud is imperative to explore point in wrongdoing examination, provocation, and measurable science and so forth. Picture Forgery Detection strategy is utilized to discover the validness of a picture. So it is necessary to discover the picture is a fake or novel. Here with our short use of procedures, an unmistakable verification picture impersonation has been exactly done. However having a couple of shots for the overhauls there are packs of potential for future research. With the smart progress of handling innovation, to catch the computerized picture is a fascinating investigation topic in forensic science.

REFERENCES

Amanpreet Kaur, Richa Sharma. (2013). Optimization of Copy-Move Forgery Detection Technique, International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 03, No. 04, pp. 76-82.

Atefeh Shahroudnejad, Mohammad Rahmati. (2006). Copy-Move Forgery Detection in Digital Images using Affine- SIFT, ICSPIC 14-15. Amirkabir University of Technology, Tehran, Iran, pp. 11-17.

Bo, X, Junwen, W, Guangjie, L. (2010). Image copy-move forgery detection based on SURF, in International Conference on Multimedia Information Networking and Security (MINES), 2010.

Fridrich, A. J., Soukal, B. D., & Lukas, A. J. (2003). Detection of copy-move forgery in digital images, in Proceedings of Digital Forensic Research Workshop.

Farid H. (2009), A survey of image forgery detection, IEEE Signal Process. Mag, Vol. 26, No. 02, pp.16-25.

Ferreira.A , Felipussi.S.C, Fonseca.P. (2016) Behavior Knowledge Space-based Fusion for Copy-move Forgery Detection, IEEE Transactions on Image Processing, Vol. 25, No.10, pp. 27-31.

Ghorbani, M., Firouzmand, M., & Faraahi, A. (2011). DWT-DCT (QCD) based copy-move image forgery detection, in 18th International workshop in the Systems, Signals and Image Processing (IWSSIP), Bosnia.

Hailing Huang, Weiqiang Guo, Yu Zhang. (2008), Detection of Copy-Move Forgery in Digital Images Using SIFT Algorithm, IEEE Pacific-Asia Workshop on Computational Intelligence and Industrial Application, Wuhan, China, pp. 272-276..

Hussain.H, Muhammad.G, Saleh S.Q. (2012), Copy-Move Image Forgery Detection Using Multi-Resolution Weber Descriptors, Eighth International Conference on Signal Image Technology and Internet Based Systems (SITIS), Naples, pp. 395-401.

Kang L., Cheng S.P. (2010), Copy-move forgery detection in digital image, 3rd IEEE International Congress on Image and Signal Processing, pp. 2419-2421.

Kavitha V.P., Priyatha M. (2014) A Novel Digital Image Forgery Detection Method Using SVM Classifier, IJAREEIE, Vol. 03, No. 02, pp. 56-71.

Lin, H.-J., Wang, C.-W, & Kao, Y.-T. (2009), Fast copy-move forgery detection. WSEAS Transactions on Signal Processing, Vol. 05, No. 05, pp. 188-197.

Li, L, Li, S., & Wang, J. (2012). Copy-move forgery detection based on PHT, proceedings in World Congress Information and Communication Technologies (WICT), India, pp. 1061-1065.

Li, S., Zhu, H., Chu, S.-C. (2013), An Efficient Scheme for Detecting Copy move Forged Images by Local Binary Patterns. Journal of Information Hiding and Multimedia Signal Processing, Vol. 04, No. 01, pp. 46-56.

Lin G.S and S.L. Cheng (2006), Dual Protection of JPEG Images Based on Informed Embedding and Two-Stage Watermark Extraction Techniques", IEEE Trans. Information Forensics and Security, Vol. 01, No. 03, pp. 330-341.

Muhammad, G., Hussain, M., Khawaji, K. (2011), Blind copy move image forgery detection using dyadic undecimated wavelet transform, in International conference in Digital Signal Processing (DSP), Greece.

Mahdian, B., Saic, S. (2007), Detection of copy– move forgery using a method based on blur moment invariants, Forensic Science International, Vol.171, No. 02, pp.180-189.

Meera MaryIsaac.,M.Wilscy. (2015), Image Forgery Detection Based on Gabor Wavelets and Local Phase Quantization, Procedia Computer Science, Vol. 58, No, 03, pp.76-83.

Manojkumar, Sangeet Sreevatsa (2017) Image Forgery Detection Based on Physics and Pixels:A Study, Australian Journal of Forensic Sciences, Vol. 51, No. 02, pp.119-134.

Popescu, A.C, & Farid, H. (2004), Exposing digital forgeries by detecting duplicated image regions. Dept. Comput. Sci., Dartmouth College, Tech. Rep. TR 2004-515.

Qu Z., Qiu G. (2009), Detect digital image splicing with visual cues, Lect. Notes Comput. Sci., pp. 247-326.

Sutcu L., Coskun B., Sencar H.T. (2007) Tamper detection based on regularity of wavelet transform coefficients, IEEE International Conference on Image Processing, USA, pp. 397-400.

Sevinc Bayram, Husrev Taha Sencar. (2009) An Efficient And Robust Method For Detecting Copy-Move Forgery", IEEE International Conference On Acoustics, Speech, And Signal Processing, Taipei, Taiwan.

Seung-Jin Ryu, Min-Jeong Lee, and Heung- (2010) Detection of Copy-Rotate-Move Forgery Using Zernike Moments, Information Hiding Lecture Notes in Computer Science, pp. 51-65.

Thajeel S., Sulong G. (2014) A Survey of copy-Move Forgery Detection Techniques, Journal of Theoretical and Applied Information Technology, Vol. 70. No. 4. pp. 25-35.

XiaoBing KANG, ShengMin WEI. (2008), Identifying Tampered Regions Using Singular Value Decomposition in Digital Image Forensics, IEEE International Conference on Computer Science and Software Engineering, Wuhan, Hubei, 926–930.

Xiang Lin., Jian-HuaLi. (2018) Recent Advances in Passive Digital Image Security Forensics: A Brief Review. Engineering, Vol. 04, No. 01, pp. 29-39.

Yu L., Han Q. and X. Niu (2014) Copy-Rotation-Move Forgery Detection using the MROGH Descriptor, IEEE International Conference on Cloud Engineering (IC2E), Boston, pp. 510-513.

BBRC
Bioscience Biotechnology
Research Communications

Security Challenges and Analysis of Various Security Models for Cloud Computing Infrastructure

P. Madhavan[1]*, G. Ravikumar[2], Shuvajyoti Ghosh[3], Bernard Shaw[4] and Arghadeep Mondal[5]

[1]*Department of CSE, SRM Institute of Science and Technology, Kattankulathur, Tamilnadu*
[2]*Department of CSE, Coimbatore Institute of Engineering & Technology, Coimbatore, Tamilnadu*
[3,4,5]*Department of ECE, SRM Institute of Science and Technology, Kattankulathur, Tamilnadu*

ABSTRACT

Cloud computing can be visualized as a online storage platform to its users who has demand and accordingly has its own pay-per-use utility. It has proven its worth by providing several convenience to its users and organization in terms of total capital expenditure and saving in operational expenditure. Though this technology has enriched its users with so much benefits, it also has some negative impact towards its users. Still after so much of advancement in this field, data handling ,security, energy efficiency are some issues of major concerns in this field. This paper analyses the upcoming views of research in cloud computing, with the objective for the advancement of this domain in the field of security. It aims to highlight some drastic inefficiencies which is suppressing the overall advantage of this field. Our main objective is to provide a guideline to this humongous topic to the future researchers and to provide solutions to heel some defects.

KEY WORDS: Cloud Model, Virtual cloud, Data Management, Mobile Cloud

INTRODUCTION

Cloud computing portrays a major change in how we store data and run them on any platform. It always points to applications and services that runs on distributed network with the use of visualized resources. It asses the common platform of protocols and the network standards. It is differentiated by the conception that resource are visual and unlimited and the particulars of the Hardware(physical) systems on which software runs are concentrated from the users, (Yassine Bounagui et al. 2018).

It provides the user compatibility accessing all the documents and application from anywhere in the world, which makes the user to work with their firms in collaboration from different locations.The National Institute of

14

Standards and Technology's defines cloud computing as, "A template for providing the suitable and when needed access to the internet, to a collective pool of programmable grids, storage, servers, software, and amenities that can be rapidly emancipated, with little communication and supervision from the provider". It also points to four deployment models namely community, Hybrid, Public clouds and Private. The service models coupled are, SAAS (Software as a Service), PAAS (Platform as a Service), and IAAS (Infrastructure as a Service). It provides the well required skeleton and characteristics which processes Homogeneity, Geographic distribution as well as virtualization and Service Orientation distributed among others.

MATERIAL AND METHODS

A. Security challenges in cloud computing

In cloud computing the security has been a major issue. The users doesn't know the exact location of their data,as the the Cloud Service Providers keep their databases in distributed locations which is unfavourable and catastrophic(Luciano Novais et al 2019). At times, adding threats and challenges. The top twelve risks associated by the cloud security association (CSA) are listed as – Legal security parameter as a precursor it also requires addition of security requirements such as authentication ,integrity etc. The basic requirements are met appropriately by protocols of Secured socket layer type. Which are Transport layer security service in a TCP protocol. Communication level issue arises as a result of sharing common resources and infrastructures of a cloud computing module.

Crypto–cloud computing

Crypto-cloud computing is one of the trending architecture of securing cloud computing. Crypto-cloud computing can be narrated as an amalgam of IAAS, PAAS and SAAS. It provides protection of information security at the system level, and allows access to users with shared service .It based on the Quantum direct key tool .In this, all the entities gets public and private key according to their ID. Each components holds its own private key.

The private key that is generated by the Key Management Centre from the user ID: $Key_{cs} = g_s(ID,M_s)$

The public key is given by: $Key_{cp} = g_p(ID,M_p)$

Here $g_{p(.)}$ M-pands the key generation mapping that is distributed to use after encryption.

Virtual machine cloning:

Virtual Machine cloning can be described as the process of making copies of the existing Virtual machine which is having the same identifier, Physical address ,computer name, IP address and MAC address is defined to be virtual machine cloning. If we make any change to the parents, its inherited clones will not get affected (Nalini Subramanian, Andrews Jeyaraj 2018).

Isolation in virtualization:

Isolation of virtual Machines is a well secure managing practice. Though IP address reusability might cause a breach.

Virtual machine Transfer:

The transfer of virtual machine from one server to another server might cause a security compromise as well as data breach as integrity compromise may be a factor of concern.

B. Energy management Cloud computing:

Currently, the service providers and huge business giants like Google, Amazon and Microsoft are among the oligopoly among the members in the Cloud computing vendors. These huge cloud tycoons set their pricing range depending on the service duration ans the usage limit of the users. The various business giants like Google, Microsoft,iCloud are using sensitive data servers at different geographical locations which supplies reliable performance to the user end. The customer's choice is still restricted due to the lack of conventional Application Interfaces (API) which are actually responsible in establishing connection between data structures, clouds, tools, etc.

The idea of rerouting which can be either iterative as well as cache routing between data centre in approach provides fast and secure transmission of data (Sudhakar, 2016).

High level–energy management solutions for cloud computing

A well dispersed cloud domain over a geographical area running over disseminated data centers and support cloud providers to optimize power management techniques with a quiet variety of objectives. The elementary idea of cloud computing management lies on balancing the data centers geographically. It's like routing a client request header to a Domain Name Server. The work load which is being processed depends mainly on sustainability. Eg. To cut down the cost related to the power and electricity consumption it could be proposed to construct the big data centers in relatively colder geographical zones.

To eliminate energy costs, Cloud providers exerts the space-time diversity of electricity prices.One of the major eco-friendly attitude of cloud developers is to cut down on the carbon dioxide & footprints. Annually ,it is known that to supply energy to Google servers around

1.75 million tons of carbon dioxide were used viewing YouTube for 10 minutes produces 10g of carbon dioxide daily, a Gmail user on average produces 1.2 kg of carbon dioxide annually. By distributing the cloud computing workloads to regions with copious nuclear or renewable generation unit would reduce the unfavourable environmental effects of cloud providers.

The generation of solar power, bio power, geothermal, and hydro power are 11.6, 50, 15, and 276 TW respectively in the year 2012 targeted to rise to 234, 490, 184, and 431 TW by 2030, respectively. Larger data centers minimize the intermittency of production of renewable energy. The load of data center is adaptable and transportable in space and time and can be coordinated well with variable renewable generation in power networks.

Cloud workloads generate data tasks for data centers. It involves operations on large data sets and utilization file systems such as the Hadoop distributed files system. Exerting those file system would affect the dynamic shift able nature of any workloads. The unpredictability in the received workloads will complicate the management of cloud workload for the data and has complex technique to manage the workloads.

Cost-oriented workload organizing and energy management reduces the quality of service in rising the delay and reduces the fault-tolerance. To maintain an allowable and reliable quality, this standard are restricted in energy management practices. To carry out energy management plan, the cloud providers form design plan for workload distribution among the data centers.. The intention of the demand response programs is to supervise the electricity demand of to progress with the power system supply. These programs can reduces the maximum demand by 20.5% in the United States. Cloud providers actively involve in demand response programs, (Yassine Bounagui et al 2018).

In passive participation, the data center demand is maintained by various smart pricing approaches such as peak pricing schemes, time of use pricing schemes, Cloud providers utilize demand response programs through auction in different electricity markets and load reduction services to regional grid operators. In spite of the possible ways for cloud providers to involve in demand response programs, there are many problems that suppress their involvement in the electricity markets..

Low–level energy management strategies

As the data centers has many IT equipment , the data network in a is designed with the primary cores which contains storage devices,servers, bridges and networking switches. The data network in a data center is designed on three primary layers namely aggregation, core and access layers that are linked via routers and switches , as shown in the figure 1.
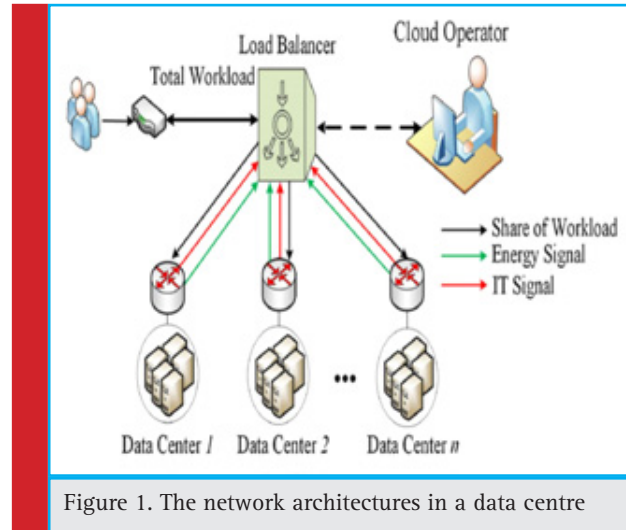
Figure 1. The network architectures in a data centre

Data centers requires huge amount of energy. The energy amount used by an normal data center is almost equivalent to the energy used by 25,000 households. Data centers require 50 times more energy than the energy used by office space. The utilization of the energy data centers in a sizeable part of energy demand and electricity network. In 2007, data centers used 1.5% of the energy generated in the United States. The increase in demand of energy of data centers in the United States is almost 10 times more than the universal increase of energy demand.

Moving towards cloud computing and the rise of advance type of applications like electronic shipment and satellite navigation, high-performance scientific computing and electronic transactions in financial services are some of the causes for such sizeable rate of growth. In the initial phases of the structure development, the criteria was set by the data centers indicators; however, the energy utilization and it's expenses and carbon dioxide emission which contributes to the total expenditure of the cloud infrastructure systems, are becoming a vital concern in the last few years. Deciding a productive model for energy utilization of a data center, as the function of the energy utilization of it's sub-components and sub-systems, is a complicated process. The energy utilization of data centers relies on a number of elements which includes cooling requirements, hardware configuration, and types of applications that run on servers.

The energy used by the software, hardware and the electricity and cooling infrastructure systems are firmly integrated. The 2 main parts of energy utilization of data centers are the energy utilization of IT resources like storage, servers, and networks and the energy utilization of the power and cooling infrastructure systems. The quantity of energy utilized by the smaller systems that differ

with the master copy of the data centers. Almost, 60% of the overall energy utilized in data center is related to the IT hardware which includes storage devices, network switches and servers; 30% of the overall energy utilized is related to the cooling infrastructure system, and 8% of the energy is lost in the data center power conditioning assets such as UPSs and PDUs.

C. Mobile cloud computing

Mobile cloud computing allows the user to fulfil tasks that needed desktop, but now can be done using mobile device. These mobile devices includes Tablets, Smart phones that can be utilized by the user (Dongcheng Zhao et al. 2019) and (Talal et al. 2018).

It is regarded as the wireless platform which on combination with the cloud computing and mobile computing enrich computational resources accessed by mobile user. Mobile cloud computing applications can be build or amended rapidly using data storage, computing task and operating systems which gives the user versatility which could not otherwise be supported. There are some key features regarding mobile cloud computing(Priti Kumari, Parmeet Kaur 2018).

D. Challenges in data level

As we move towards this topic seems to be promising on the other hand it has to deal with challenges on various aspects. In present state, available on the cloud, has scopes for many doubts. Few challenges including security feasibility, matters, interoperability and many others. Substitutes and correct resolutions to deal with different challenges, while others emphasized the requirement for more enhancements.

Security is a vital concern that doubts the consideration of any external data processing and holding that data. These concerns surpassing the foreseeability of lost data and corruption in the matters of trust, availability of service, and impulsive issues. Certain facts validate the accessibility challenge as an example Google services causes intermission in 2008 ranging from 1.5 to 8

Table 1. Security challenges faced by the components in cloud	
Threat number	**Threat name**
1	Compromised credentials and broken authentication
2	Data breaching
3	Hacked Interfaces
5	Exploited system vulnerabilities
6	Account hijacks
7	Malicious intruders
8	Advanced persistent parasitic threats
9	Permanent loss of data
10	Cloud service abuses
11	Shared technology, shared dangers

hour periods. Ten obstacles were highlighted by authors for the extension of cloud computing beside with potential occasions for retrieval. From these obstacles there is the secrecy of data for which they advise data encryption opportunity for a tenacity.

One of the suggestions is the declaration given by Service Level Agreement (SLA) that is between the service provider and the user. On the other hand, in one of the projected prospects is a "multi-tenancy" support in this changeable security options allow entities to adjust to their required context.

It is thought-provoking to rationalize the price model in cloud services term. Customers need to contemplate of various trade-offs concerning the price of communication, security mechanism, computing power and integration. The organization price will be substituted by the cost of connectivity and data transfer. Controlling the price of communication is not an option, due to the high dependence on regular huge amounts of data transfer.

If we consider the special case of crossbreed clouds where continuous data transfer is essential between the public cloud, in-house IT infrastructure, and the private cloud. The administrative judgments of picking an appropriate estimate model based on the accessible substitutes. The start of on-demand services that bid sensible usage-based fees for start-ups, in dissimilarity to the high cost of in-house substructure. Cloud services will integrate or replace with an in-house organization, which involves a serious study of the charge-back model. Price analysis becomes more composite related to the establishment of legacy organization. Three major areas for promoting customers over the cloud, which are the cost of access, storage, and processing. That surges the analysis magnitudes considering a public cloud service. On the other hand, scheming a safe design will have an overhead of optimization platform to have a cut down the public cloud cost.
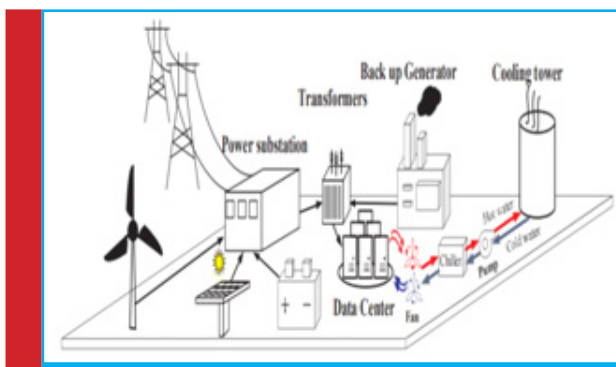
Figure 2. Energy efficient infrastructure for data centers

P. Madhavan *et al.*

E. Mobility management

Mobility Management (MM) methods have predictably been federal in nature, a single network unit has been accountable for treatment the mobility linked responsibilities of the mobile nodes devoted to the network. In an exponential growth in network traffic and the number of users has escorted in the concept of providing Mobility Management as a Service (MMaaS) to the wireless nodes attached to the %G networks. Permitting for on-demand mobility management resolutions will not only provide the network with the suppleness that it needs to camp the many different use cases that are to be assisted by future networks, but it will also deliver the network with the scalability that is needed together with the litheness to assist future networks. And hence, in this paper, a detailed study of MMaaS has been providing, emphasizing its welfares and challenges for 5G network, (Dongcheng Zhao et al 2019).

CONCLUSION

Certain security matters in computational and Service Level Agreement are analysed. In the computational level, both virtualization and data linked security challenges are said to be the vibrant vulnerable entity. Virtualization can be described as a prerequisite component of cloud computing. Data associated security matters are categorised as concerns on data and data in transmission. Exploring both the challenges and there is great need to explore any issues relatable to them.

Present day, security challenges are countless thus providing a lump some opportunities for hackers to break the crypto-system. In this work, complete view of the existing status of mobile cloud computing are analysed and indicated the major research challenges faced by mobile cloud computing. Based on the dedicated survey, several research challenges were identified ad these

challenges mainly include privacy, security trust, bandwidth, data transfer, synchronization, energy effciency, heterogeneity and data management.

REFERENCES

Azzedine Boukerche, Robson E. De Grande (2017), Vehicular cloud computing: Architectures, applications, and mobility, Computer Networks,135: 171-189.

Carson et al. (2018), Emerging trends, issues and challenges in Internet of Things, Big Data and cloud computing, Future Generation Computer Systems, 87: 416-419.

Dongcheng Zhao et al. (2019), Mobile-aware service function chain migration in cloud fog computing Future Generation Computer Systems.

Luciano Novais et al. (2019), A systematic literature review of cloud computing use in supply chain integration, Computers & Industrial Engineering: 296-314.

Magdi S. Mahmoud, Yuanqing Xia (2019), A survey of fault tolerance in cloud computing, Networked Control Systems 91-125.

Nalini Subramanian, Andrews Jeyaraj (2018), Recent security challenges Computers & Electrical Engineering, 71(1):28-42.

Priti Kumari, Parmeet Kaur (2018), A heterogeneous mobile cloud computing model for hybrid clouds, Journal of King Saud University - Computer and Information Sciences.

Sudhakar, B. (2016), Enhanced Sentiment based Text to Speech Synthesis Using Forward Parsing with Prosody Feature for English, Bonfring International Journal of Data Mining, 06(04):53-55.

Talal H et al. (2018), Mobile cloud computing: Challenges and future research directions Journal of Network and Computer Applications 115(1):70-85.

Yassine Bounagui et al. (2018), Toward a unified framework for cloud computing governance: An approach for evaluating and integrating IT management and governance models, Computer Standards & Interfaces.

BBRC
Bioscience Biotechnology
Research Communications

Performance Realization of MANET Routing Protocol Using Swarm Intelligent Optimization Algorithm

K. Devarajan[1]* and Dr. V. Padmathilagam[2]

[1]Department of Electronics and Communication Engineering, Annamalai University, Chidambaram, Tamilnadu, India
[2]Department of Electrical Engineering, Annamalai University, Chidambaram, Tamilnadu, India

ABSTRACT

Mobile Ad-hoc Network (MANET) is an autonomous network that consists of mobile hosts and establishes the communication among the mobile nodes without the support of any centralized infrastructure. Due to the characteristics of infrastructure less and frequent topology changes in MANETs there are several concerns and constraints that affect the network performance like mobility, interference, overhead. Several optimization techniques have been used to determine the best and optimal solutions. For an optimization problem, Genetic Algorithm (GA), Ant Colony Optimization (ACO) and the Artificial Bee Colony Optimization (ABC) techniques are widely adopted swarm intelligent techniques when compared to others. In this paper, a comparative analysis of these techniques has been performed in the MANET. These optimization techniques take the input such as packet delivery ratio, congestion value and mobility for optimized routing in MANET. The packet delivery ratio has been taken from the Markov Chain (MC) model analysis, congestion (routing overhead) limit from the Relative Traffic Link Matrix Routing Algorithm (RT-LMRA) method and mobility from the Manhattan Grid (MG) mobility model for optimizing the routing in MANET. The performance of optimization techniques has been analyzed based on the metrics such as arrival rate, delay, routing overhead, throughput and energy consumption. Among the three optimization techniques, ABC dominates the other two techniques for both proactive and reactive routing in the MANET (GA and ACO). The simulation parameter has been kept same and the performance of these techniques has been analyzed using the NS-2 simulator.

19

INTRODUCTION

Mobile Ad-hoc NETwork (MANET) is an infrastructure-less collection of independent devices called nodes that carry forward communication through wireless medium in an ordered on-request broadcast initiating process. This characteristic makes these networks greatly exile and robust. Meanwhile, other characteristics such as mobility, limited bandwidth make the routing a challenging work in MANET (Gupta et al. 2013). An efficient routing protocol is required to discover a communication route between two mobile nodes.In MANET routing, protocols are majorly classified into three types- Proactive, Reactive and Hybrid routing protocol. In an on-demand basis the reactive routing protocol discovers the routes but it does not update the routing tables frequently, e.g. AODV and DSR. Each node maintains a table in the proactive routing protocol that comprises of the latest information about the routes to reach a node. Here control messages are periodically exchanged between the nodes, e.g. DSDV and OLSR.

The combination of proactive and reactive routing comes under the category of hybrid routing protocols e.g. Zone Routing Protocol (ZRP). Swarm Intelligence techniques such as Genetic Algorithm (GA), Ant Colony Optimization (ACO) and Artificial Bee Colony Optimization (ABC) are biologically inspired algorithms, which are more favorable for the MANET because of their functioning and design systems (Kamaldeep and Lokesh 2015). The routing protocols that are inspired by swarm intelligence are more efficient in tackling different issues that arise in the routing in MANETs (Ali Zulfiqar and Shahzad 2011; Vinothkumar et.al 2017).

MATERIAL AND METHODS

End-to-End Delay - Network throughput and packet end-to-end delay are the two most important parameters used to evaluate the performance of wireless ad-hoc network. Generally it is difficult to achieve both high throughput and low packet delay. In this work,the objective is to achieve a high throughput while keeping the packet delay low.By analyzing the conventional shortest path algorithm and the Markov chain model incorporated OLSR and AODV (Devarajan and Padmathilagam, 2015), it has been inferred that Markov chain with 100 nodes outperforms in increasing the throughput.

Network complexity (Congestion) - Congestion control is a major issue in MANET as there are no central access points or controllers. Congestion is a problem that occurs on shared network, when multiple users want access a resource (bandwidth, buffer and queues) and the demand of this resource is greater than thecapacity

Table 1. Performance measures of the conventional shortest path algorithm and the markov chain model based OLSR and AODV routing protocol with 100 nodes

Technique	Routing Protocol	Throughput (kbps)	End-to-End Delay (m/s)	Energy (J)	PDR (%)
Conventional Routing Protocol	OLSR	54	100	1.813	60
	AODV	91	50	1.906	72
Markov Chain Model	OLSR	78	50	1.859	74
	AODV	99	40	1.973	80

of network. In this work, the objective is to achieve low routing overhead while maintaining the data transmission (Chen et al. 2017). By analyzing the COCO technique and RT-LMRA incorporated DSDV and AODV (Devarajan and Padmathilagam 2015), it has been inferred that RT-LMRA with 100 nodes outperforms in reducing the routing overhead.

Table 2. Performance measures of the COCO and RT-LMRA based DSDV and AODV routing protocol with 100 nodes

Technique	Routing Protocol	Throughput (kbps)	End-to-End Delay (m/s)	Energy (J)	Routing Overhead	PDR (%)
COCO	DSDV	23.84	68.40	1.90	0.132	69.33
	AODV	44.03	37.06	2.84	0.110	81.22
RT-LMRA	DSDV	48.38	64.58	0.77	0.090	78.85
	AODV	156.63	32.19	1.14	0.011	81.26

Mobility node - The mobility model is designed to describe the movement pattern of mobile user and how their location, direction of movement, pause distribution, speed and acceleration change over time. In this work, the objective is to achieve minimum mobility node speed.By analyzing of the RWP and MG based DSDV and AODV routing protocol with mobility speed of 50 m/s (Devarajan, K., and Padmathilagam, V., 2016), it has been inferred that MG with 100 nodes outperforms in with maximum throughput and minimum routing overhead.

The initial limit for throughput is chosen from the Markov chain model that yields a better Packet Delivery Ratio (PDR) and congestion (routing overhead) from Rela-

Technique	Node Speed Mobility (m/s)	Throughput (kbps)	Routing Overhead	Active Links	Bandwidth (b/s Hz)	Arrival Rate (b/s)
AODV (RWP)	50	56.688	0.600	107	0.346	4.102
DSDV (RWP)	50	67.191	0.900	110	0.493	6.150
AODV (MG)	50	95.009	0.278	220	0.403	10.260
DSDV (MG)	50	68.200	0.891	140	0.516	7.620

Table 3. Performance measures of the RWP and MG model based DSDV and AODV routing protocol with 100 nodes versus mobility speed 50 m/s

tive Traffic Link Matrix Routing Algorithm (RT-LMRA) analysis as it outperforms other models (Devarajan and Padmathilagam 2015); Devarajan and Padmathilagam 2015). Manhattan Grid (MG) mobility model is chosen as it outperforms RWP model in all performance indices (Devarajan and Padmathilagam 2016). Since the initial limits are chosen using comparative analysis of all methods the optimized output will converge quickly and accurately

ROUTING PROTOCOLS

In this work two forms of routing protocol are analyzed:-

Proactive routing protocol
Reactive routing protocol

Proactive routing protocol - In this scheme, the congestion control mechanism is to build reservations of network resources so that resource availability is deterministically guaranteed to admit conversations, (Mohan and Rajan 2012). It requires each node to keep up a routing table (Destination address, Sequence number and metric) for next hop to reach a destination node and the number of hops to reach destination. Users can be permitted to send data without reservation of resources, but with a possibility that if the network is heavily loaded, the user may receive low utility for network. In proactive control protocols, this work concentrates on Destination Sequenced Distance Vector (DSDV).

REACTIVE ROUTING PROTOCOL

This method is appropriate in reservation less networks. In this case, users have to settle in according to changes in network state and congestion control refers to the way in which a network can allow users to detect changes in network state. Reservation less networks is more prone to congestion. In reactive routing protocols, this work concentrates on Ad-hocOn Demand Distance Vector (AODV).

METHODOLOGY

The aim of routing protocol is to find the shortest path between the source and the destination and to improve performance indices. GA, ACO and ABC are incorporated with an objective to maximize packet delivery ratio, throughput and minimize end-to-end delay, routing overhead, and energy consumption. Simulation is carried out in Network Simulator (NS-2). The results are presented and analyzed.

Genetic Algorithm (GA) - The genetic algorithm is applied for all the nodes (population) and all possible routing paths(chromosomes) are obtained and encoded with a string of positive integers which indicate the ID's of the nodes (Cheng Hui et al. 2013). The routing paths (chromosomes) are provided with fitness value f(x) and the highest fitness value is considered to be the best path. The top two paths are identified and a crossover occur leading to generation of off springs (children). Off springs will be placed as nodes (population) for the next generation of routing paths (chromosomes). The old routing paths are (chromosomes) replaced by new routing paths. Thus genetic algorithms will be constructive for dynamic routing.

Algorithm–1 GA algorithm with optimization procedure for relay node selection

1. Initially, generate a set of possible solutions (all possible routing paths).
2. Calculate the fitness value for all possible solutions (better path).
3. Generate the next set of suitable solutions (populations) by subsequent steps.
a) Sort - solutions with 2 better fitness values are chosen.
b) Crossover – cross over the parents to form new children. If no cross over takes place then children will be the copy of parents. (best two routing path).
c) Mutation - change the position of the nodes with mutation probability.
d) Accept – Place the children in next possible set of nodes.
e) Replace – Use new set of nodes for the next possible solutions.

Ant colony optimization (ACO) - ACO is a probabilistic method valuable in dealing with determination of feasible paths through graphs using its pheromone value (Nancharaiah and Chandra Mohan 2013). The simulating agent i.e., ant finds the feasiblesolution by travelling via factors to space and indicates all probable solution. The ant naturally lays the pheromones directing each and every one to resource when exploring the environment. The simulated agent correspondingly stores their

position and the quality of their solution. Later, several simulating ants look for a better solution. The relay node selection using the Ant colony optimization has been considered in this study. Initially, the nodes will determine their neighbor based on the communication range of each other. Then the throughput Th, mobility m and the node capacity nc are given as input. The weighted average method is used to get the fitness value using equation 1.

$$W = w_1 \times Th + w_2 \times m + w_3 \times nc \tag{1}$$

Here w1, w2, w3 are the corresponding weighting parameters of throughput, mobility and network capacity.

The node calculates its pheromone value relied upon the normalized battery power and the number of neighborhood nc. The pheromone function τ_i is relied upon the probability of forwarding using equation 2.

$$\tau_i = \frac{\tau_{i-1} + \Delta\tau}{1 + \Delta\tau} \tag{2}$$

Here $\Delta\tau$ has been given in equation 3

$$\Delta\tau = x \times \frac{e}{E_{max}} \times \frac{1}{N_c} \tag{3}$$

Where x is the learning rate of algorithm and it has been set to 0.1, E_{max} is the reference maximum battery power. The algorithm for relay node selection using the ACO is given in algorithm 2.

Algorithm–2 relay node selection using ACO algorithm with optimization procedure

1. Initially, in a random manner the nodes will be selected as relay node in the selected relay set
2. At every iteration, the node will be selected as relay node relied upon the neighbor nodes probability

$$P_i = \frac{\tau_i}{\sum_{k=1}^{n} \tau_k}$$

Where n is the number of neighbor nodes, τ is the pheromone value deposited by the ants while traversing the link to determine a route

3. Every time a node has been elected as a relay node, the pheromone value has been updated as follows

$$\tau_i = (1 - \rho)\tau_i + \rho(W)$$

Where ρ indicates the evaporation factor of pheromone $0 < \rho < 1$

4. The step 2 and 3 has been repeated for each node in the neighbor set till each node in the network has been covered

5. The pheromone and weight value of a node is greater than its neighbor is elected as a relay node
6. The neighbors will send an acknowledgment to the elected relay node
7. For every node repeat the step from 2 to 6 till the destination has been reached

Artificial bee colony optimization (ABC) - The ABC algorithm contains three types of bees: employed bees, scout bees and onlooker bees. Half of the swarm of the colony made of is employed and onlooker bees (Kalucha, R., and Goyal, D. 2014). Employed bees are in charge of nectar source exploitation and providing the information to the onlooker bees in the hive about the food quality.Based on the information shared by the employed bees, the onlooker bees evaluate and choose the food source. The scouts randomly search the colony so as to determine a new food source based on an internal aim. For the relay node selection using the ABC is given in algorithm 3.

Algorithm–3 ABC algorithm with optimization procedure for relay node selection

1. Initially, in a random manner the nodes will be selected as relay node in the relay set, in which the employed bees has been placed
2. Generate a new solution v_{ij} in the neighborhood of the node for the employed bees as follows

$$v_{i,j} = x_{i,j} + \Phi(x_{i,j} - x_{k,j})$$

Here k is the solution of the neighbor of i, Φ is the random value in the range [-1,1]

3. Calculate the probability pi for the solution xi considering Weight W

$$p_i = \frac{w_i}{k = \sum_{k=i}^{n} w_k}$$

4. Normalize pi values into [0,1]
5. Exploit new solution for onlooker bees based on the probability
6. Find the abandoned food and modify with the best one stopping criteria met
7. For every node repeat the step from 2 to 7 till the destination has been reached

Figure 1. Shows the input fed to GA, ACO and ABC and also the techniques used to choose the limits.

RESULTS AND DISCUSSION

Simulation Setup and Parameters - The Network Simulator-2 (NS-2) is used to perform the network simulation. Linux is chosen as the platform for the simulation since it provides a number of programming tools. The scenario of the mobility is the Manhattan Grid model,
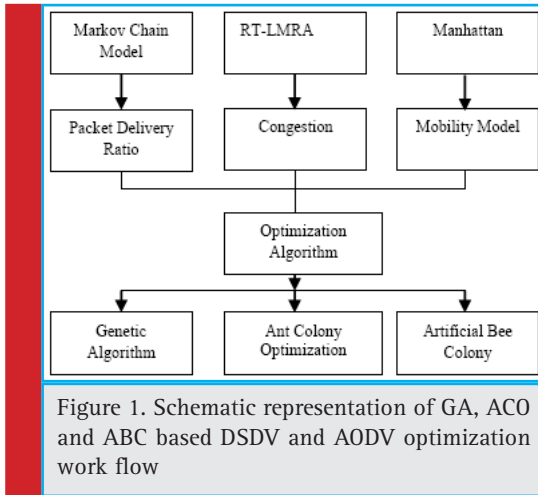
Figure 1. Schematic representation of GA, ACO and ABC based DSDV and AODV optimization work flow

Table 4. Simulated system parameters for GA, ACO and ABC optimization based DSDV and AODV routing protocol with 100 nodes

Parameter	Value
Surface of the networks	1000 m2
Number of nodes	100
Size of data packet	500 bytes
RTS, CTS, ACK size	30 bytes
Traffic type	Constant Bit Rate (CBR)
Routing Protocol	DSDV, AODV
Antenna type	Omni-Antenna
Channel band width	20kpbs
Initial Energy	2J
Transmission Range	250 m
Simulation time	100 s
Mobility model	MG

adapted for providing a regularized mobility pattern for each of the deployed nodes. The simulation parameter is shown in Table 4.
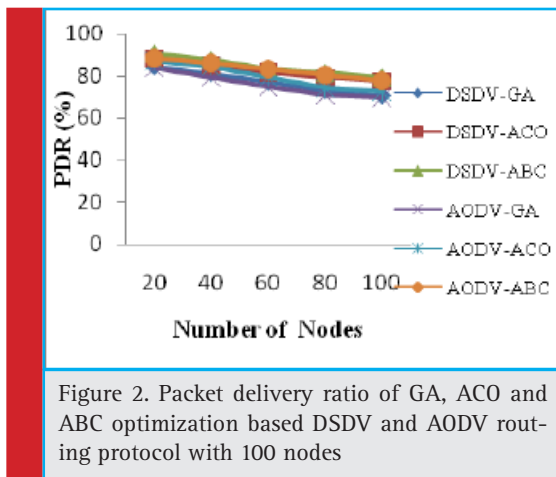
Figure 2. Packet delivery ratio of GA, ACO and ABC optimization based DSDV and AODV routing protocol with 100 nodes
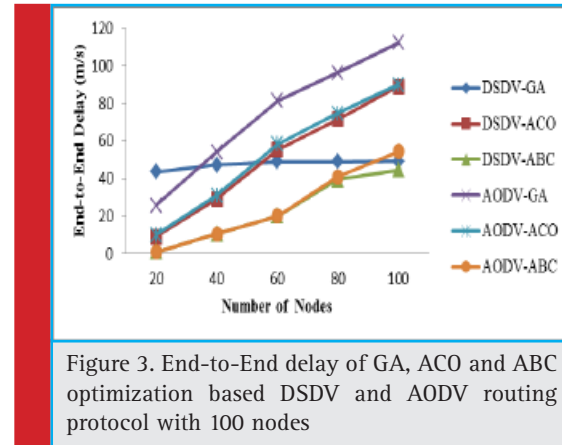
Figure 3. End-to-End delay of GA, ACO and ABC optimization based DSDV and AODV routing protocol with 100 nodes

PERFORMANCE METRICS AND ANALYSIS

The simulation results are presented and analyzed, focusing on routing overhead, throughput, end-to-end delay, packetdelivery ratio and energy. The results are compared between Genetic Algorithm (GA), Ant Colony Optimization (ACO) and Artificial Bee Colony Optimization (ABC) and the method with the best performing method is chosen.

PACKET DELIVERY RATIO (PDR)

Figure 2 shows the packet delivery ratio of GA, ACO and ABC optimization based DSDV and AODV routing protocol with 100 nodes. In a GA optimization based on DSDV. The observedpacket delivery ratio with 100 nodes is 70.5% whereas 79% is observed for same nodes in ABC optimization based on DSDV. Similarly, GA optimization based on AODV achieves 69.7% while ABC integrated with AODV shows 77.4% for the same 100 nodes.
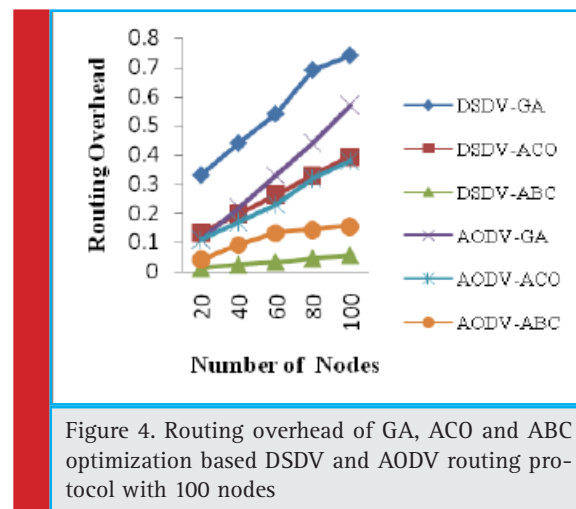
Figure 4. Routing overhead of GA, ACO and ABC optimization based DSDV and AODV routing protocol with 100 nodes
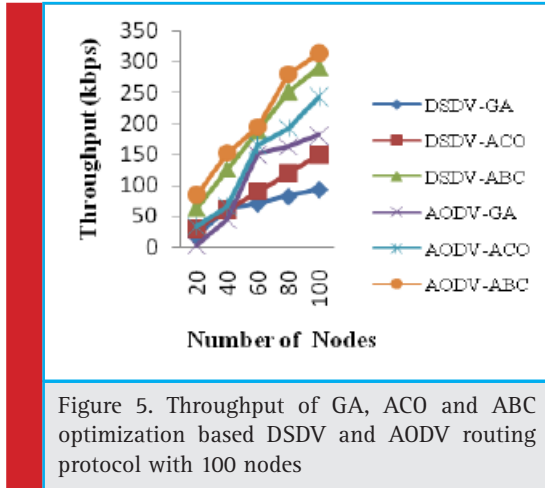
Figure 5. Throughput of GA, ACO and ABC optimization based DSDV and AODV routing protocol with 100 nodes
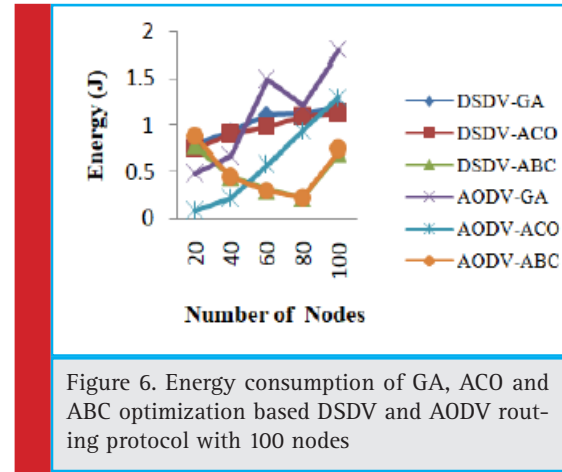
Figure 6. Energy consumption of GA, ACO and ABC optimization based DSDV and AODV routing protocol with 100 nodes

END–TO–END DELAY

As inferred from the Figure 3 end-to-end delay vs. number of nodes the delay of ACO optimized static (DSDV) and dynamic (AODV) routing protocol in higher compared to GA and ABC increases with the increase of number of nodes in the network. The chosen method best suits for static and dynamic routing protocols in

Table 5. The various performance indices like throughput, end-to-end delay, routing overhead, energy and packet delivery ratio of GA, ACO and ABC optimization based DSDV and AODV routing protocol with 100 nodes.

Parameter	No. of Node	DSDV			AODV		
		GA	ACO	ABC	GA	ACO	ABC
Throughput (kbps)	20	18.08	30.00	63.00	2.98	34.00	84.00
	40	62.38	60.00	126.00	45.28	67.00	152.00
	60	71.01	90.00	189.00	150.88	166.00	194.00
	80	82.33	120.00	252.00	163.27	193.00	280.00
	100	93.66	150.00	291.00	181.63	244.00	314.00
End-to-End Delay (m/s)	20	43.66	8.99	0.93	25.67	9.99	0.93
	40	47.22	29.25	10.59	54.11	31.25	10.59
	60	49.12	55.47	20.03	81.41	58.47	20.03
	80	49.13	71.70	39.52	96.34	74.70	41.06
	100	49.21	89.02	44.53	112.45	90.02	54.53
Energy(J)	20	0.80	0.75	0.78	0.48	0.09	0.88
	40	0.93	0.91	0.45	0.67	0.22	0.45
	60	1.11	0.98	0.30	1.50	0.58	0.30
	80	1.12	1.09	0.22	1.22	0.94	0.22
	100	1.18	1.13	0.70	1.81	1.30	0.75
Routing Overhead	20	0.33	0.13	0.01	0.11	0.11	0.04
	40	0.44	0.19	0.02	0.22	0.17	0.09
	60	0.54	0.26	0.03	0.33	0.23	0.13
	80	0.69	0.33	0.04	0.44	0.32	0.14
	100	0.74	0.39	0.05	0.57	0.38	0.15
PDR (%)	20	84.50	88.00	90.50	83.60	87.00	88.30
	40	81.10	85.00	87.50	79.30	84.30	86.00
	60	75.00	81.50	84.30	74.60	79.20	83.10
	80	73.00	79.00	81.20	71.00	74.40	80.30
	100	70.50	77.50	79.00	69.70	72.60	77.40

GA optimized based on DSDV as the end-to-end delay observed with 100 nodes is found to be 49.21 m/s whereas ABC optimized based on DSDV is only 44.538 m/s. Similarly, ABC optimized based on AODV incurred 54.53 m/s with 100 nodes, whereas integrated with GA optimized based on AODV incurred 112.45 m/s.

ROUTING OVERHEAD

Routing overhead is the additional routing process that is required after a routing error. Decreasing the routing error decreases routing overhead and improves the stability of the network. Routing overhead is also caused due to frequent link changes. Routing overhead is inferred to be lower in ABC optimized based on DSDV and AODV produce 0.056 and 0.156 routing overhead factors respectively, whereas GA optimized based on DSDV and ADOVproduce routing overhead factors of 0.74 and 0.57 respectively, when observed with 100 nodes deployment.

THROUGHPUT

Figure 5 shows the throughput of GA, ACO and ABC optimization based DSDV and AODV routing protocol with 100 nodes. ABC optimized DSDV and AODV achieve 291 kbps and 314 kbps respectively, whereas GA optimized based on DSDV and AODV achieve throughput of 93.66 kbps and 181.63 kbps respectively.

ENERGY CONSUMPTION

Dynamic frequent link adaption networks require higher transmission energy and consume more energy compared to a static network. In ABC optimized protocol the energy consumption is less when compared to GA and ACO. The observed energy consumption for 100 nodes with ABC optimized DSDV and AODV routing protocol are 0.7J and 0.75J respectively. For the samescenario, GA optimized based DSDV and AODV routing protocol consumes 1.1J and 1.8J respectively Table 5. shows the performance metrics of GA, ACO and ABC optimized based DSDV and AODV routing protocol.

CONCLUSION

The performance of dynamic and static routing protocols for MANET is evaluated using metrics like surface of the network, number of nodes, size of data packet, initial energy, transmission range, simulation time and mobility model is carried in this work. The results show that incorporating optimization techniques such as Meta-Heuristic Genetic Algorithm (GA), Ant Colony Optimization (ACO) and Artificial Bee Colony Optimiza-

tion (ABC) to the routing protocols elevate the performance of the network by reducing the congestion and improving the throughput. ABC optimization considers both a centralized and de-centralized routing filament value to change its dispatchers or to switch over paths in the network so, the ABC optimization, when integrated into both proactive and reactive protocol performs better than the other techniques. The other two algorithms lack the process of de-centralized control as they are capable of re-tracing the path using defined adaptable link functions. The simulation results prove that ABC is best suited for routing optimizations in a MANET utilizing DSDV and AODV routing protocol.

REFERENCES

Al Amri, H., Abolhasan, M., and Wysocki, T. (2010), Scalability of MANET routing protocols for heterogeneous and homogenous networks, Computers & Electrical Engineering, Vol. 36, No. 4, pp 752-765.

Ali, Z., and Shahzad, W. (2011), Critical analysis of swarm intelligence based routing protocols in ad hoc and sensor wireless networks, in Computer Networks and Information Technology (ICCNIT), pp. 287-292.

Cheng, H., Yang, S., and Cao, J. (2013), Dynamic genetic algorithms for the dynamic load balanced clustering problem in mobile ad hoc networks, Expert Systems with Applications, Vol. 40, No. 4, pp. 1381-1392.

Qin, Z, Gao, Y & Plumbley, M. D (2018), Malicious user detection based on low-rank matrix completion in wideband spectrum sensing. IEEE Transactions on Signal Processing, Vol. 66, No.1, pp. 5-17.

Devarajan, K and Padmathilagam, V. (2015), An Effective and Efficient Congestion Control Scheme for MANET using COCO Method, International Journal of Emerging Technology and Advanced Engineering, Vol. 5, No. 8. pp. 185-189.

Devarajan, K and Padmathilagam, V. (2015), Optimized Path Evaluation for Mobile Ad-hoc Wireless Networks Using Enriched Protocols, International Journal of Applied Engineering Research, Vol. 10, No. 2, pp. 2419-2431.

Devarajan, K., and Padmathilagam, V. (2016), Performance Evaluation of MANET Routing Protocol using Random Way Point and Manhattan Mobility Models, Middle-East Journal of Scientific Research, Vol. 24, No. 8. pp. 2523-2530.

Ejaz, W., Manzoor, K., Kim, H. J., Jang, B. T., Jin, G. J., and Kim, H. S. (2013), Two-state routing protocol for maritime multi-hop wireless networks. Computers & Electrical Engineering, Vol. 39, No. 6, pp. 1854-1866.

Guo, L, Zhang, L, Peng, Y, Wu, J, Zhang, X, Hou, W, and Zhao, J. (2012), Multi-path routing in spatial wireless ad hoc networks, Computers & Electrical Engineering, Vol. 38, No. 3, pp. 473-491.

Gupta, V, Verma, A, Lala, A and Chaurasia, A. (2013), Scenario Based Performance and Comparative Simulation Analysis of

Routing Protocols in MANET, International Journal of Computer Science and Network Security, Vol. 13, No. 6, pp. 751-756.

Kalucha, R, and Goyal, D. (2014), A Review on Artificial Bee Colony in MANET, International Journal of Computer Science and Mobile Computing, Vol. 3, Issue 7, pp. 34-40.

Kamaldeep, K, and Lokesh, P. (2015), Review of Various Optimization Techniques in MANET Routing Protocols, International Journal of Science, Engineering and Technology Research, Vol. 4, No. 8, pp. 2830-2833.

Mahmood, T., Nawaz, T., Ashraf, R., and Shah, S. M. A. (2012), Gossip based routing protocol design for ad hoc networks, International Journal of Computer Science Issues (IJCSI), Vol. 9, No.1, pp. 177-186.

Mohan, R., Rajan, C., and Shanthi, D. N. (2012), A stable mobility model evaluation strategy for MANET routing protocols, International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 2, No 12. pp. 58-65.

Nancharaiah, B, and Mohan, B. C. (2013), Routing in mobile ad hoc networks (MANETs) using fuzzy aided Ant Colony Optimization (ACO) technique, Journal of Theoretical & Applied Information Technology, Vol. 52, No. 2, pp. 227-235.

Pi, S, and Sun, B (2012), Fuzzy controllers based multipath routing algorithm in MANET, Physics procedia, 24, 1178-1185.

Vinoth Kumar K, Jayasankar T, Prabhakaran M and Srinivasan V (2017), Fuzzy Logic based Efficient Multipath Routing for Mobile Adhoc Networks, Appl. Math. Inf. Sci. Vol. 11, No. 2, pp. 449–455.

K. Vinoth Kumar, Dr. S. Bhavani (2015), Trust Based Multipath Authentication Protocol for Mobile Ad Hoc Network" **Journal of Computational and Theoretical Nanoscience**, Volume 12, Number 12, pp. 5479-5485(7).

K. Vinoth Kumar, Dr. S. Bhavani (2015), An Effective Localization based Optimized Energy Routing for MANET" Journal of Theoretical and Applied Information Technology, ISSN: 1992-8645, E-ISSN: 1817-3195, Vol. 77. No. 2.

Zou, Y, & Yoo, S.J (2016), Attack detection scheme against cooperative spectrum sensing data falsification on common control channel in cognitive radio networks. Wireless Personal Communications, Vol. 88, No. 4, pp. 871-896.

Zhou, M, Xie, L, & Li, J (2017), Cooperative spectrum sensing with M-ary quantized data in cognitive radio networks under SSDF attacks, IEEE Transactions on Wireless Communications, Vol. 16, No. 8, pp. 5244-5257.

Intelligence Intrusion Detection Using PSO with Decision Tree Algorithm for Adhoc Networks

R. Kiruba Buri[1]* and T. Jayasankar[2]

[1]Department of IT/CSE, University College of Engineering (BIT Campus), Anna University, Tiruchirappalli, Tamil Nadu
[2]Departmernt of ECE, University College of Engineering (BIT Campus), Anna University Tiruchirappalli, Tamil Nadu

ABSTRACT

Intelligence Intrusion Detection is used to detect and predict network which analysis the environment and flexibility to achieve higher detection on accuracy in Ad-hoc network. MANET are highly exposed to vulnerable security attack at various level. All nodes in the network involved in routing in order to collaborate with each node. If node does not cooperate with each other and do not forward packets behave malicious they consider to be selfish nodes. Several techniques are available for find out selfish nodes to enhance the detection of malicious nodes and improve the network efficiency, throughput and reduce the detection time of selfish node. To overcome these problem and attacks, we proposed 'Intelligence Intrusion Detection using PSO with Decision Tree Algorithm for Ad-hoc network'. Which is successfully used to detect and prevent malicious activities.Particle Swarm Optimization algorithm is proposed to prevent and the malicious node and to optimize the data route. Decision Tree algorithm used to detect malicious node involved In Ad-hoc network. The combined PSO and Decision Tree algorithm achieves high accuracy in finding the intruder node and diminished false alarm rate, which provides better performance. when compared to ant colony system of finding the malicious node in the MANET. This proposed system is effectively increases the performance of MANET in terms of numerous parameters like throughput, over-head, delay and packet delivery ratio.

KEY WORDS: IDS–INTRUSION DETECTION SYSTEM, PSO - PARTICLE SWARM OPTIMIZATION, DECISION TREE SPLIT (DTS)

INTRODUCTION

Adhoc network is an autonomous system node connected with linked together without any infrastructure. The nodes in the ad hoc network are self configurable and establish network whenever the communication link is required. Each node in the network communicates with other node using radio waves. The goal is to find out the efficient and best feature selection method and classification for IDS in Adhoc Networks. IDS aims to identify and prevent abnormal activity of the node or network. The IDS able to adopt to manage to detect software and hardware changes. The IDS should be able to overcome with the system crash and be able to recover from the breakdown. The IDS should monitor the entire network and able to detect the compromised node and itself able to protect the unauthorized access or attacks. The IDS ought to detect the infringements with low processing and communication overhead. (Saravanan and Chandrasekaran, et al., 2015).

The particle swarm optimization (PSO) is one of the optimization approach based on the behavioral study of animals/birds. A feature subset selection which is compared to GA and also provides better results than GA. The purpose of feature selection is to accomplish the activity into normal or intrusive. PSO is a efficacious global search technique. PSO is best for feature selection problems due to easy encoding of feature, global search facility, less parameters, and easier implementation. The particles swarm is initialized arbitrarily and then it progressed in the search space to search the best subset of features by informing its position and velocity (Ahmad. et al., 2015).

In *Dynamic Ant Colony System* uses a different level that helps ants to find the stout features. The method is used to find out the feature selection, accuracy classification and route based on individual ant behaviors. Poor selection of features can leads to high rates of false positives and false negatives. ACO is Meta-heuristic optimizations behavior of ants finds a path between their colony and a source of food. They update routing table periodically by using FANT and BANT. This algorithm resulted in an optimal feature set that created capable detection model in terms of accuracy, (Rais & Mehmood et al., 2018).

The IIDPS consists of a central network administrator for detecting malicious nodes in the MANETs, which categorizes the trust of the network into different categories. Here trust is evaluated on the basis of previous transactions. The central administrator role is finding malicious node with calculating trust and risk factor in nodes. Numerous attacks are acknowledged by the behavior classifier based on a predefined threshold and risk factor conditions. The main aim of IIDPS is responsible for preventing MANETs from the flooding, black hole, and selective packet drop (Vinothkumar et al. 2017).

In this technique trust length and risk factors are evaluated on the basis of different levels of trust. At the same time, the prevention system improves the performance of the network in the terms of numerous parameters like throughput, overhead, delay, packet delivery ratio etc. A selected path from the one end to other end is based on the highest trust value and low risk factor values (Opinder Singh et al., 2017).

The lack of security in manet is more susceptible to black hole attack in which, malicious drop packets them instead of forwarding which leads to collaborative black hole attacks, low efficiency in routing, storage and computational overhead. To overcome this problem D-MBH algorithm used to detect attacks with target address and create a list of black hole attacks by computing a threshold ADSN. D-CBH is responsible for creating list of collaborative black hole attacks by using fake RREQ with nonexistent target address. Using the threshold value the D-CBH algorithm finds a, list of black hole nodes and collaborative black hole nodes by neighbor node RREP (Arathy et al., 2016).

MATERIALS AND METHODS

A . Proposed Work

In this paper we proposed a new technique to improve the performance of a IDS in manet to detect the malicious node by assuming the various parameter such cost, performance, delay etc. PSO with Decision tree algorithm will accurately remove and identify the malicious nodes in the network and find the optimal path between the source and destination. The Figure 2 shows proposed model of the DTS Steps. The C4.5 Decision tree split is used in order to improve the performance of trusted node to reach the destination quickly without any delay and also no path loss occur in between adhoc nodes.

The architecture consists of following modules

1. Initialization
2. Detection using DTS
3. Aggregation using PSO
4. Optimization

Initialization:
Every node in Adhoc network is initialized with common energy value and energy level of nodes may vary according to communication. The Figure 1 shows the entire module sequence of proposed system. The initialization process depends on the issues of certificates among the nodes themselves and formation of active nodes in the network and form a trust relationship between them.

Figure 1. Architecture Diagram for Proposed Model
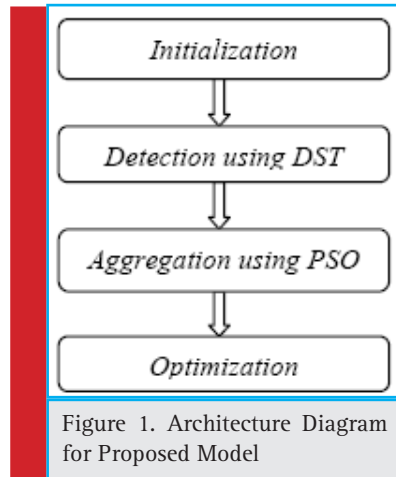
Detection Using Decision Tree

The detection method performed using the Decision tree algorithm. It is used to classify the malicious node from throughput method it's called Node bits size. Decision trees can scrutinize and classify characteristics of the node carry out malicious activities. The decision tree algorithm is based on C4.5 where feature selection and split value are key issues for construct a decision tree. In this module C4.5 decision tree is used to classify whether nodes is trusted node or malicious node. The main goal is minimize the tree level and maximize the data generalization. C4.5 uses the concept of information entropy. C4.5 uses gain ratios instead of gains. By this way, it creates more generalized trees and ability to use attributes with different weights. Initially sorting all the values of attribute to select a split value and choosing the threshold value. The highest gain ratio value is selected as the split value for that particular node. (Roy et al., 2015).

C4.5 classification steps,

1. For every feature 'a', calculate the gain ratio by dividing the information gain of an attribute with splitting value of that attribute.
2. Next information gain and entropy is calculated by using formulae.
3. Discover the attribute with the utmost gain ratio. Here the greatest gain ratio is for the attribute 'a_best'.
4. Build a judgment node that divides the nodes on the attribute 'a_best'.
5. Reiterate steps from 1 to 3 on each subsets created by isolating the set on attribute 'a_best' and pop in those nodes as successor of parent node.

Thus the high degree of trusted node in the network is achieved through decision tree algorithm. Trust can also be defined as the level of assurance that one node about other node. The trust is the degree of reliability about node interactions with other nodes. The level of confidence is calculated by one node about other node based on previous transaction history. This trust value depends on time and direct interpretation or recommendations from trusted neighboring nodes. The high degree of trusted node in the network is achieved through decision tree algorithm.

Data Aggregation using PSO:

Data aggregation process can augment the strength and precision of information by regression methods. The PSO algorithm is used to forecasts the link lifetime and node lifetime, available bandwidth mobility of nodes and energy drain rate respectively. PSO is evolutionary iterative techniques. In Figure 2 represents the data flow procedure for proposed system. In every iteration each node is updated by two best values. They are Pbest (local best value) and Gbest (global best value). Pbest is fitness achieves so far and Gbest is value that is tracked by the PSO by any node in the population. Each node tries to modify its current position and velocity according to distance between its current position of Pbest and Gbest nodes. Compare the current fitness Pbest (new) value with previous Pbest value. Finally assign the best node of Pbest value to Gbest. Fitness value is satisfies it will terminate here else once again it will calculate the velocity of node each node and evaluate the fitness values of nodes. (Bhushan et al., 2015).

Optimization

Optimizations is a computational method which iteratively trying to improve a specified measure of quality. This module will continuously check the each node in the routing until it satisfies the condition. Each node in the network is evaluated by PSO fitness function and update its Pbest and Gbest value of node. Optimized node to move the swarm toward the best solutions. The selected node from route will find the finest path from the source node and destination node, (Robinson et al., 2015).

c. Security Issues

Adhoc nodes in wireless network are deployed in hostile environment, these nodes are always prone to be attacked by adversaries due to limited constraints such as limited battery, less computation power and low memory space. It is very important to detect such adversaries in wireless network so as to avoid false information from attackers through compromised nodes. These malicious nodes can inject some packets to start different types of attacks such as black-hole attack, selective packet drop/forwarding attack, or they can implement Denial of Service (DoS) attacks.

Black-Hole Attack

A attack in which malicious node claims itself as a destination node and drops each and every routing packets in
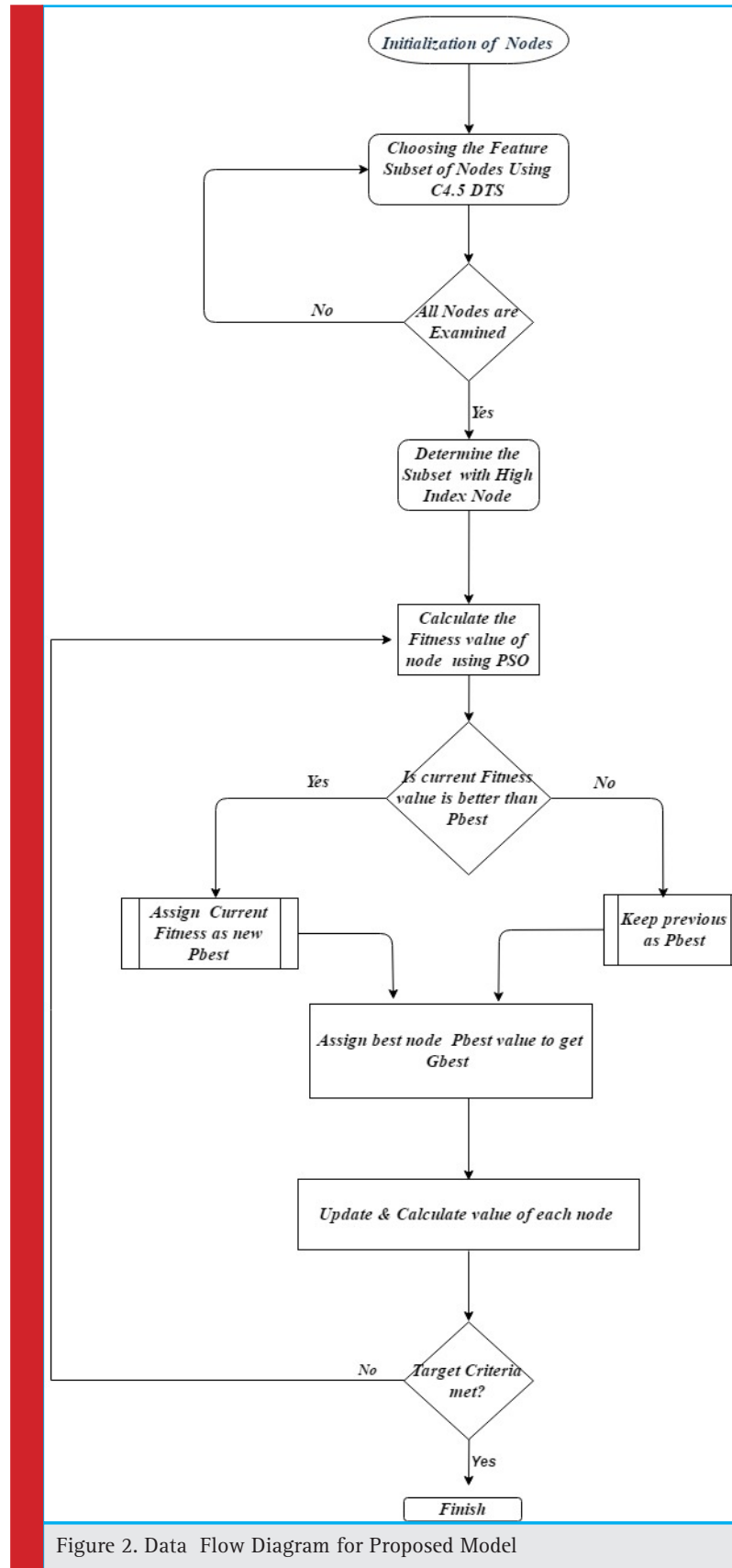
Figure 2. Data Flow Diagram for Proposed Model
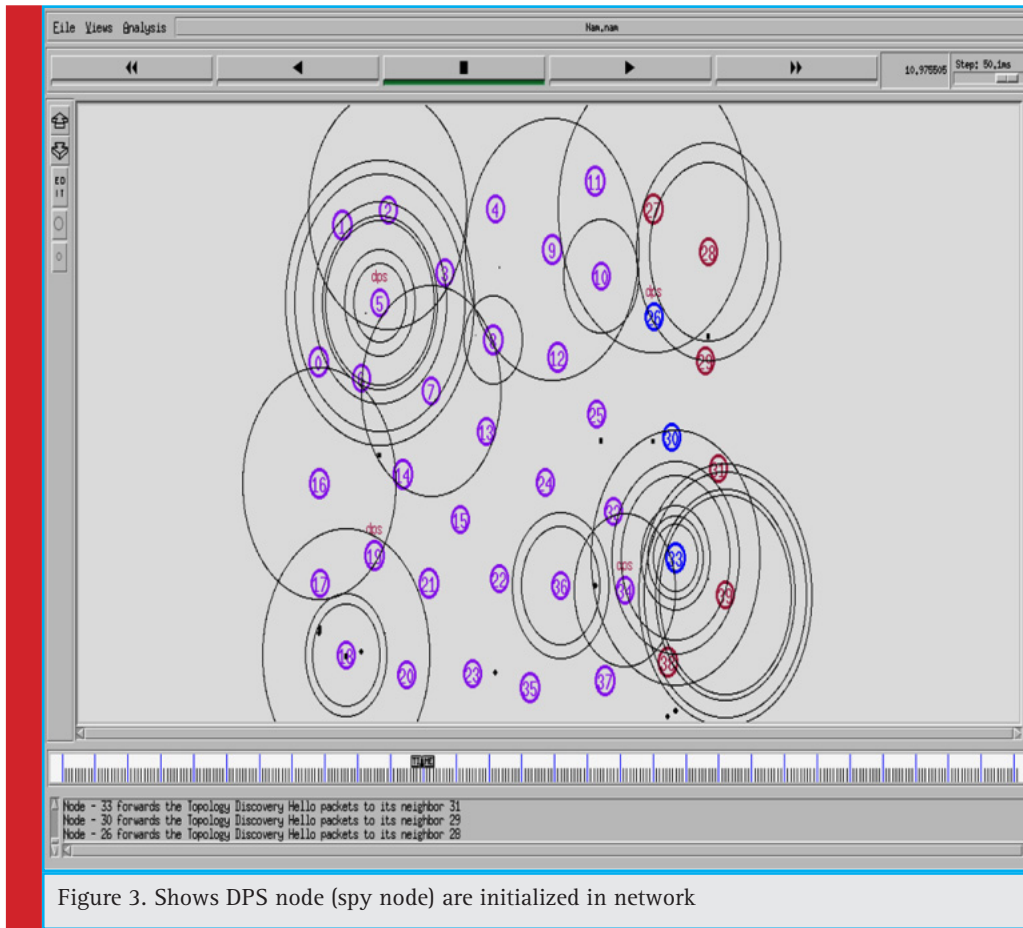
Figure 3. Shows DPS node (spy node) are initialized in network

transmission from its neighbor node, but it actually it is not as it claims, this type of attack in MANET is known as Black-hole attack. These attacks are major drawbacks in security issues of a MANET, since the malicious node can drops every packets and attacks the privacy of transmission in the network. our proposed IDS determines nodes by setting the packet dropping as a factor in calculating the trust-worthiness of the node in the mutation phase and selects the trusted node. Thus, the possibility of black-hole attack in MANET is restricted
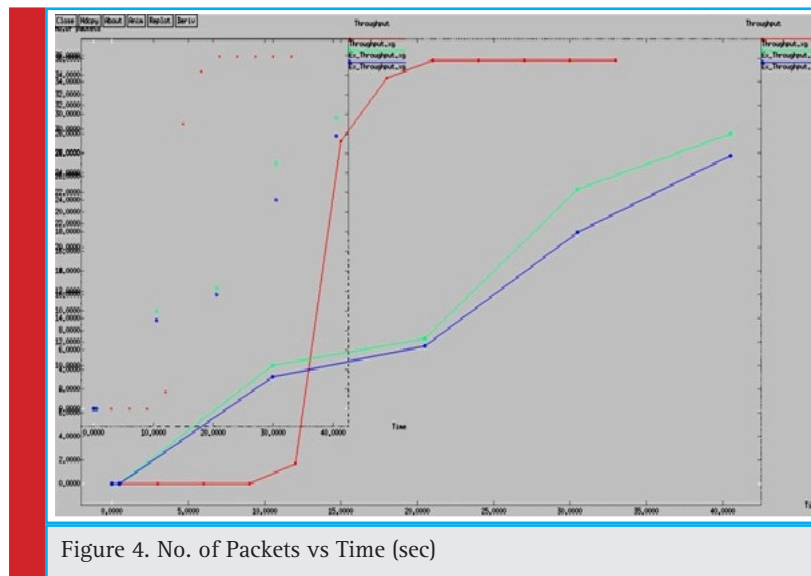
Figure 4. No. of Packets vs Time (sec)
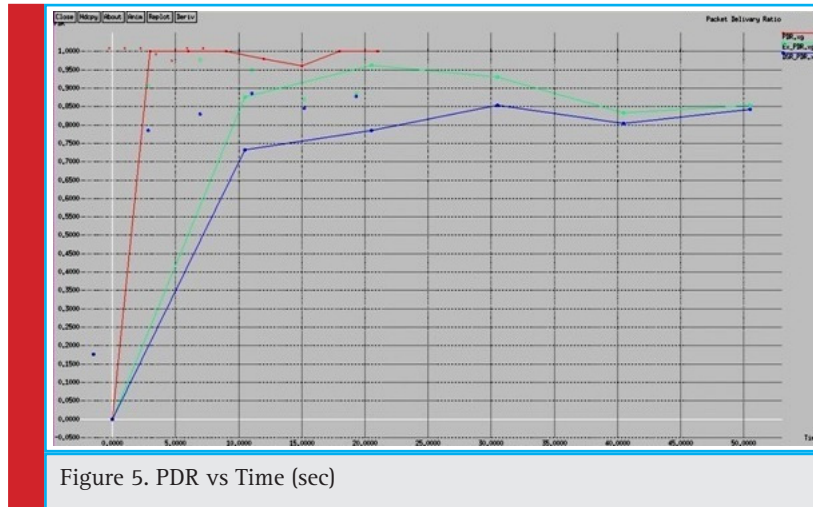
Figure 5. PDR vs Time (sec)

and the malicious nodes are blocked for further involvement in the network.

Worm Hole Attack

Worm hole attack is commonly explained as when a set of nodes connects end points claiming itself as a shortest route in the network. If such link exists in the MANET, then the malicious node can be involve in such a link and drops packet and neither it forwards. Wormhole attack can be possible not only by a single node, but also a collection of node connects via a wormhole-link.

As proposed, the IDS is evolved from the concept of PSO & DTS, the possibility of worm-hole attack is also restricted into the system.

Rushing Attack

In every protocol of MANET, the initial task is to perform a proper valid route from source to destination, before the transmitting its data packets. For such purpose, the sender node broadcasts a RREQ (route request) message through its neighbor to the destination node. Once, the destination node receives the RREQ, it with
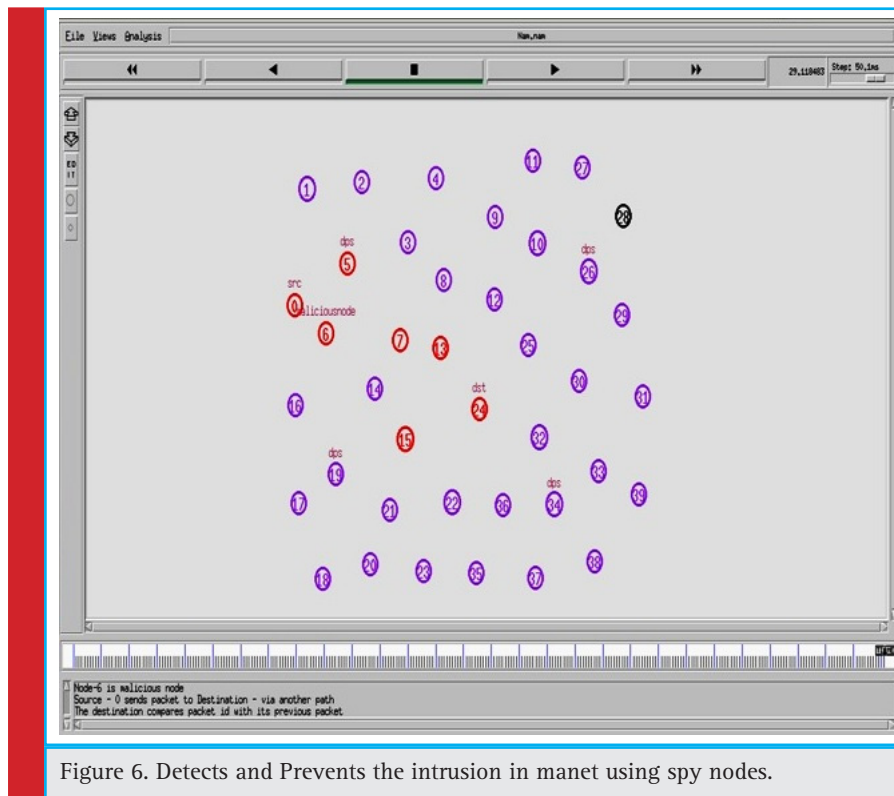
Figure 6. Detects and Prevents the intrusion in manet using spy nodes.

RREP (route reply) with proper route information of the node involved in transmission. Thus, if a duplicate suppression mechanism exploits the network, then it is termed as Rushing attack. It also increases the delay in delivering the data packets to the destination node.

DOS Attack

A DoS attack is used reduce a network's performance which ultimately lead to inaccessibility of the resources. Dos attack makes network resource unavailable to its intended users by temporarily distracting services by flooding the target network with traffic. Some of the most commonly used DDoS attack types include: UDP Flood, ICMP (Ping) Flood, ping of death and zero day dos attacks. These types of attacks are avoided due to our effective optimization algorithm, which is highly capable of monitoring sending RREQ and receiving RREP from the receiver and reduces the false positive rate.

RESULTS AND DISCUSSION

The simulation scenario shows the detailed analysis of Parameter used in PSO with DST optimization techniques on AODV protocol is described below.

1. *Inputs to Simulator:* Simulation TCL file.
2. *Outputs File:* Trace file and Network Animator file.
3. *Output from trace file:* X graph file

Parameter	Value
NS-2 Version	2.35
OS	Ubuntu 16.10
Simulation Area	1000m X 1000m
No. of Nodes	50
Routing Protocol	AODV
Simulation time	200s
Traffic type	CBR, TCP
Packet Size	512 bytes
Optimization Techniques	Particle Swarm Optimization with Decision Tree Algorithm.
Mobility Model	Random Way Mobility
Output File	X graphs (.xg)

SIMULATION PARAMETER:

The figure 3 shows the node initialization between neighbor node and source sends the beacon signal (hello Packets) and update the routing table to find out the destination path. The DPS node are initialized and monitoring the neighbor node.

The Xgraph for the above simulation showing the Packet Delivery Ratio (PDR) and Throughput graph is shown below Figure:4 & Figure:5

This Xgraph shows the variation of normal throughput vs expected throughput.

It shows the variation in Expected PDR and Normal PDR xgraph for the proposed work which gives high values in all expected.

The proposed system efficiently detects and prevents the intrusion in manet. The result of the above simulation gives the exact prediction of the malicious node involved into the network. The IDS depicts and block the intruder and finds a better route for the data packet transmission from the source node to the destination node.

CONCLUSION

In the proposed work, *Intelligence intrusion detection using PSO with Decision Tree Algorithm for Ad-hoc network,* to detect the malicious node using decision tree algorithm and optimize the route of the network using the PSO algorithm. The routing can be optimized and the best route for data transmission is selected. As Proposed, the Decision Tree Algorithm, finds the malicious node through its conditional checking capability by using screen parameter of the node. Thus the fitness of node is calculated by PSO increase the stability of network & increase the efficiency of the network. Thus the combined algorithm give an efficient secured network from collaborative attacks, increase the trustworthy of node overcome route delay as expected. This IDS system provide better security than other evolutionary algorithms.

REFERENCES

Arathy K S, Sminesh C N, (2016) Novel Approach for Detection of Single and Collaborative Black Hole Attacks in MANET", Procedia Technology 25, 264-271.

Bhushan S. Chaudhari, (2015) Particle Swarm Optimization Based Intrusion Detection for Mobile Ad-hoc Networks", Advances in Information Science and Computer Engineering, ISBN: 978-1-61804-276-7.

Chi-Hyuck Jun Yun Ju Cho Hyeseon Lee (2012) Improving Tree-Based Classification Rules Using Particle Swarm Optimizatio https://link.springer.com/chapter/10.1007/ 978-3-642-40361-3_2.

Robinson YH, Rajaram M. (2015) Energy-Aware Multipath Routing Scheme Based on Particle Swarm Optimization in Mobile Ad Hoc Networks" Scientific World Journal. doi: 10.1155/2015/284276 PMCID: PMC4707019.

Rais HM and Tahir Mehmood, (2018) Dynamic Ant Colony System with Three Level Update Feature Selection for Intrusion Detection International Journal of Network Security, Vol.20, No.1, PP.184-192.

Opinder Singh, Jatinder Singh and Ravinder Singh, (2017) An Intelligent Intrusion Detection and Prevention system for Safe-

guard MANET against Malicious node", Indian Journal of Science and Technology, vol. 10(14).

Sunil Kumar and Kamlesh Dutta, (2017) Direct trust-based security scheme for RREQ flooding attack in mobile ad hoc networks International Journal of Electronics, 104:6, 1034-1049.

Saravanan, SRM. Chandrasekaran, (2015) "Intrusion Detection System using Bayesian Approach, International Journal of Engineering and Innovative Technology (IJEIT), ISSN: 2277-3754.

Roy RA., Jitha P Nair; Elizabeth Sherly (2015) Decision tree based data classification for marine wireless communication 2015 International Conference on Computing and Network Communications (CoCoNet) IEEE Explore 10.1109/CoCoNet. 2015.7411255.

Vinoth Kumar K, Jayasankar T, Prabhakaran M and Srinivasan V (2017), Fuzzy Logic based Efficient Multipath Routing for Mobile Adhoc Networks, Appl. Math. Inf. Sci. Vol. 11, No. 2, pp. 449–455.

Vinoth Kumar K., Bhavani S. (2015), Trust Based Multipath Authentication Protocol for Mobile Ad Hoc Network" **Journal of Computational and Theoretical Nanoscience**, Volume 12, Number 12, pp. 5479-5485(7).

Vinoth Kumar K., Bhavani S. (2015), An Effective Localization based Optimized Energy Routing for MANET" Journal of Theoretical and Applied Information Technology, ISSN: 1992-8645, E-ISSN: 1817-3195, Vol. 77. No. 2.

BBRC

Bioscience Biotechnology
Research Communications

Red Traffic Light Detection in An Image Using Hough Transform

K. R. Jothi*, R. Lokeshkumar, S. Anto, Rishabh Kant Singh, Utkarsh Krishak

School of Computer Science and Engineering, Vellore Institute of Technology (VIT), Vellore, India

ABSTRACT

It is a vital task to count the quantity of the objects within the image mechanically. As a result of the objects within the image are generally overlapped with one another and even coated with completely different formed objects, it's terribly troublesome to detach these objects before investigating them. Circular Hough remodel has been used extensively to find and count overlapped objects with circular shapes. But it can't detach the overlapping circular objects expeditiously, and also the investigating task can give inaccurate results once the circular objects are coated with random formed objects. To modify this downside, an integrated technique is planned based on the Hough transform and Contour Detection ways. Moreover, a computer code is enforced using the pycharm and also the CV2, numpy and OS libraries. The experimental results clearly show that the projected technique will find and notice the co-ordinates of circular objects in a picture.

KEY WORDS: IMAGE PROCESSING; CIRCULAR OBJECTS; HOUGH TRANSFORM; CONTOUR DETECTION

INTRODUCTION

Computer vision may be a field that has strategies for capturing, pre-processing, analyzing, and understanding pictures. a subject within the development of this field has been to copy the abilities of human vision by electronically seeing and understanding an image. Computer vision is a large field, having various subfields, and every all of the sub fields are totally different from each other. In these sub-fields of laptop vision, it's a vital task to count the number of objects within the image. Ordinarily enumeration objects with an unadorned human eye appearance simple, however the most factor is it'll take a while till the person completes enumeration all objects in a very such space (Mohanasundram et al. 2017).

The human errors in enumeration objects can decrease the work potential and it's additionally terribly effortful

for the person activity the task. There may also be some overlapping objects within the scene that create the task difficult to accomplish.

For the detection of any sort of objects in image process, it's necessary to tell apart the article you wish to sight from alternative objects within the scene or inside the background. this could beachieved with many image process techniques like applying threshold technique on the pictures and getting a binary image to sight the blob of white pixels (Ventola et al. 2014). Morphological approaches like erosion and dilation may also be applied. However, relying upon the scenario there are some deficiencies existing within the strategies introduced higher than, as an example, the morphological primarily based approach isn't such a lot economical to upset clumps of circular formed objects e.g. car red lights (Yuan et al. 2016)

After detection of the objects, successive step is to count objects. For additional accuracy, it's necessary to phase all the objects very well before investigation them, which suggests that the objects ought to be separated from one another. This detached object situation provides us the advantage of enumeration random formed objects exactly. Various approaches are being planned to upset the enumeration drawback by pictures. As an example, Rizon used the Circular Hough remodel (CHT) technology to sight single circular object, wherever the bar graph exploit technique is applied as a primary step to extend the distinction within the image (Levinson et al. 2011). Subsequently canny edge detection algorithm is applied, followed by disjunction filter and at last CHT is also applied to sight circles. Orazio planned a way supported on Circular Hough remodel together with neural networks to differentiate ball from alternative circular formed objects. On the idea of those works higher than, an integrated approach is planned to alter the article enumeration task during this paper, which might be applied to a picture having random colours of circular objects and ellipsoidal objects (Fregin et al. 2017).

Some experiments are administered, wherever the test image has some circular formed overlapping objects whereas one circular and ellipsoidal formed objects are overlapped with one another. Our planned approach can, with success phase all the overlapping objects and can additionally count them expeditiously.

MATERIAL & METHODS

Object detection and recognition in creaky and cluttered pictures is difficult problem in computer vision. Form detection could be a basic downside in image process field, shapes like lines, circles and ellipses will employ totally different areas like road detection (YeFeng et al. 2014). Hough remodel works by mapped each edge picture element into parameter house and use the standard HT to notice lines or circles or any constant form. several HT based mostly algorithms for police investigation circles was developed exploitation totally different quite ways, reduces the accumulator array to reinforce the computation time along with the memory consumption, (Zhang et al. 2018).

Different ways used picture element gradient data (5) for reducing the computation time and accumulator array. (6) C. T. Ho and L. H. bird genus used circle geometrical properties for performance sweetening (7). Xu et al.910 developed randomized Hough remodel (RHT) that desires less computation time along with the memory storage scrutiny with normal HT, by selecting3 non-collinear edge pixels (a, b, r) arbitrarily and mapped them into parameter house (Jiqiang Song et al. 2005). An easy and ballot strategy within the accumulator collected as proof so as to form call on circle existence. The experiments exploitation twenty five pictures to gauge the performance of the system to notice circular image patterns within the image. The very best success rate of the planned system to notice the thing was ninety six by moving the circle template each twenty pixels to the proper and twenty pixels down and the success rate was eightieth even for the worst moving as shown in Table 1.

Table 1. The success rates of each template moving		
No	Template moving [pixel]	Success rate (%)
1	10	88
2	15	80
3	20	96
4	25	80
5	30	80

There area number of issues in detecting and recognizing the circular patterns inside the image. To start with, the objective question is darkened as a result of the nearness of the contrary protest which may meddle with acknowledgment strategy like the palm clears out (Gevers et al. 1999). Second, a number of the objects are overlapping between one another that create the recognition method difficult(D. Ballard et al. 1981). Third, the various object positions and eventually, the pictures itself contain noise that create the popularity method troublesome without correct pre-processing and segmentation method (Stallkamp et al. 2012). The prevailing rule is meagre to detach the overlapping objects and is therefore having less accuracy in detecting circular patterns inside the image (Sudhakar et al. 2016). The error occurred once the captured image having circular shapes were far-off from the camera. If the pictures ware taken so much, the circular image tends to be tiny and troublesome to find.

A. PROPOSED SYSTEM

The main contribution of this work consists of using along2completely different techniques so as to require advantages from the peculiarity of every of them: initially the disconnection filter technique is employed to get the best object candidates and second, the CHT is performed to observe the presence of circular form. The separability filter was introduced by Fukui et al. and has been used in iris detection in the meantime the CHT may be a kind of Hough rework (HT) which will extract circular objects from a picture IV.

ADVANTAGES

1. The following technique is capable enough to detect and recognize the individual objects from the image and find the circular pattern objects using CHT and canny edge detection.
2. It finds significant use in self-driving cars where the car on its own can judge the red traffic light and stop at a particular threshold from the traffic signal. This is possible because the sensor in the car can detect the red circular pattern such as the red light and signal the car to stop at a certain threshold.
3. The cost of implementing the project is minimal.
4. The process is efficient, reliable having good performance and requires less time consumption.
5. This technique will run on any windows software package.

In this study, an integrated approach is planned to understand the separation and enumerating task by pictures, and also the basic contents of this task square measure summarized in Fig. 1. In the planned integrated approach, there square measure seven main steps:

(1) First off, the image is retrieved and so it's regenerated into a grayscale image, for the sake of quick computation and information reduction.

(2) Within the next step, the canny edge detection algorithm is applied to identify the perimeters. Edges are detected at the locations where pixels have sharp intensity changes.

Figure 1. Overall flow diagram of the procedure adopted.

Figure 2. Flow diagram of implementation.
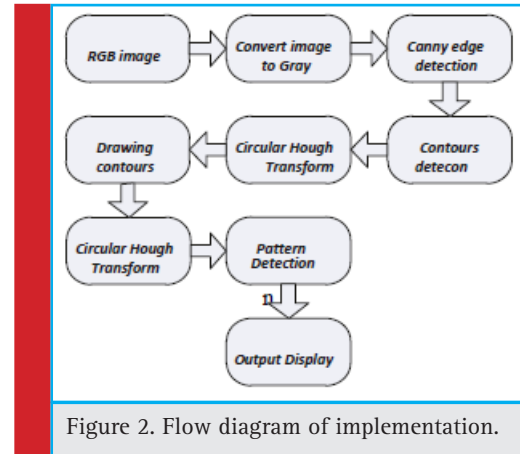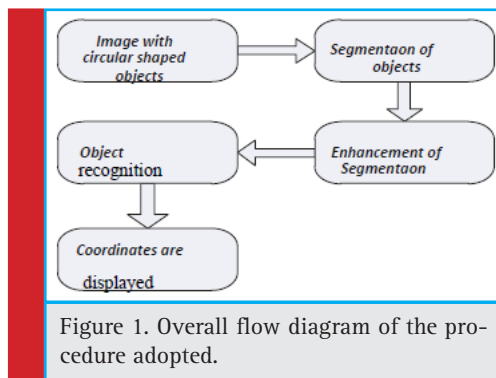
After declaring the parameters of the canny edge detector can take away the pixels having noise to the best extent and also the edgesof the specified objects become clearer. (3) Future step is to seek out the detected edges contours within the image. to form easiness within the next steps, all the contours square measure drawn with red color, for having a higher visibility and a bigger pixel intensity distinction. (4) Subsequently circular Hough remodel is applied, that may be a variation of Hough remodel, to sight the circular object contours. (5) Then the contours of circular form objects square measure drawn and stuffed internally. (6) The circular Hough remodel is once more applied however this point with a special purpose, to urge the completely detached objects. (7) Within the last mark, any possible technique will be applied to sight the white blobs within the image. Within the planned approach, the contour detection algorithm is employed once more to count objects no matter their shapes. Then those results square measure drawn on the first image to show the ultimate output. The work flow of the planned approach is shown in Fig. 2 and the main processes of the planned approach square measure introduced as follows.

B. EDGE DETECTION

The aim of performing edge detection normally is to considerably cut back the quantity of information in a picture, which can be used in the additional process. This step will increase the computational speed of the approach whereas protective the structural characteristics of the image. Edge detection in image process will be applied to the RGB pictures and might even be applied to the grayscale image. Applying on the grayscale pictures decrease the procedure necessities. Many algorithms exist for edge detection, like Prewitt, Sobel, Roberts and canny are out there out of that the performance of canny is much higher. Even if it's quite recent, it's become one amongst the quality edge detection ways and is employed in our work.

The canny Edge Detection algorithm consists of 5 steps:

1. Smoothing: during this step, the image is blurred to get rid of noise, so it will be used for additional process.
2. Finding gradients: the perimeters ought to be marked wherever the gradients of the image has giant magnitudes. It implies that the sides wherever the intensity of the image has an abrupt amendment are going to be marked as a footing.
3. Non-maximum suppression: Solely native maxima ought to be marked as edges, and edges with the values less than the native most are discarded to get a lot of correct and sharp edge detections.
4. Double thresholding: The object edges are being determined by thresholding. Even when the applying of minimum suppression, the edge pixels detected square measure quite ok to present the important edge. However, there are still some more edge pixels at the step caused b variation due to noise and color. So as to get rid of the noise caused by these 2 factors, it's needed to filter the sting pixels having the weak gradient price and solely preserve the perimeters with the high gradient price.
5. Edge trailing by hysteresis: when performing all the higher than steps we have a tendency to get nearly correct edges however still there will be edges that square measure separate, raising the likelihood of the perimeters detected caused because of noise, that the final edges are going to be determined by suppressing all edges that aren't connected to a really bound or sturdy edge.

C. Contour detection

Contour detection could be a technique to seek out the boundaries of pixels with sharp intensity changes. Contour perform operation on a group of points connected to every alternative, possibly to be situated on the outlines of objects. Contour detection algorithm takes a binary image as input that will be the output of the canny edge detector. This information is accustomed extract and drawn any contour relying upon the user demand.

D. Hough Transform

The Hough transform (HT) has been recognized as a really powerful tool for the detection of constant quantity curves in pictures. It's enforced by a vote method that helps in mapping image edge points into manifolds into properly outlined parameter area. The Circular Hough transform (CHT) is one in all the changed versions of the HT. The aim of using CHT is to search out the circular patterns among a picture scene. The CHT is employed

to rework a collection of points inside the image area into a collection of accumulated votes in a parameter area. The array parts that contain the best variety of votes indicate the presence of the form. A circle pattern is represented by

$$r = \sqrt{(x - x_0)^2 + (y - y_0)^2}$$

(1) Wherever x0 and y0 are the coordinates of middle and r is the radius of the circle.

The advancement diagram of CHT to detach circular objects during this paper is shown in Fig. 3.

Figure 3. The workflow diagram of detachment process based on CHT
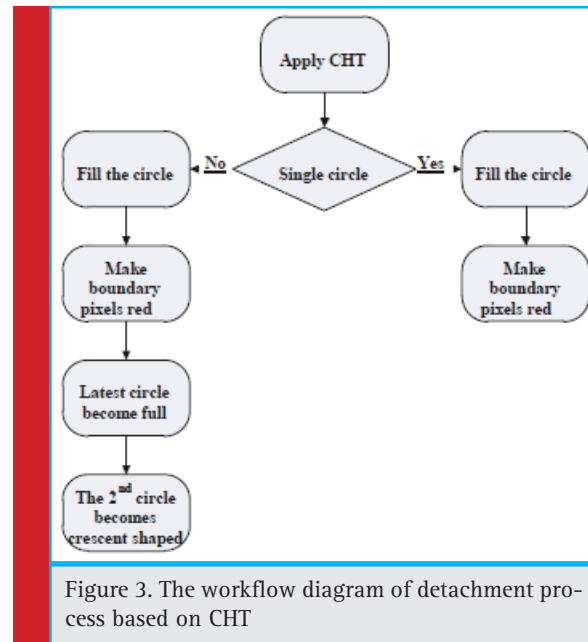
APPLICATIONS

1.2 It will acknowledge and find image at identical time specially utilized in car cameras (for our case in smart self–driving car).

Further it also can be used in airport to guide the plane to stop at a certain place in the airport which can be done by using this application in the plane and a person will guide the plane to park at a certain location on the runway and it will follow the red circular light which the person is holding and automatically follow where the person is going and hence no need for the pilot to sit there for parking the plane.

1.3 ALGORITHM

STEP 1: Declare a Video Capture object and associate to digital camera, zero => use first digital camera.

STEP 2: Check if Video Capture object was associated to digital camera with success.

STEP 3: # if not, print error message to std out

STEP 4: pause till user presses a key therefore user will see error message.

STEP 5: and exit operate

STEP 6: till the Esc key is pressed or camera affiliation is lost

STEP 7: browse next frame

STEP 8: if frame wasn't browse with success

STEP 9: print error message to std out

STEP 10: pause till user press a key therefore user will see error message

STEP 11: exit while loop

STEP 12: blur

STEP 13: shut image (perform dilation, then erosion)

STEP 14: closing "closes" (i.e. fills in) foreground gaps

STEP 15: escape number of columns and rows within the image, rows is employed for minimum distance between circles in decision to hough circles.

STEP 16: fill variable circles with all circles within the processed image

STEP 17: this line is critical to keep program from crashing on next line if no circles were found

STEP 18: for every circle

STEP 19: escape x, y, and radius

STEP 20: print ball position and radius

STEP 21: draw tiny inexperienced circle at center of detected object

STEP 22: draw red circle around the object detected

STEP 23: produce windows, use WINDOW_AUTOSIZE for a hard and fast window size

STEP 24: or use WINDOW_NORMAL to permit window resizing

STEP 25: show windows

STEP 26: take away windows from memory.

RESULTS AND DISCUSSION

To take the performance test of the projected approach, some experiments are applied. During this study, our experimental work is enforced using python libraries coupled with pycharm. Libraries like CV2, numpy and os are very economical and has quick process and fewer time consumption for performing pc vision tasks. Pycharm is adopted as an implementation tool in our technique.

In the experiments, an RGB image is inputted from the camera using OS library. Then the image is born-again into the grayscale image which is capable to be utilized in succeeding steps to avoid delaying and wasting the computation time, as time is taken into account to be the foremost necessary factor in image process.

After that canny edge detector is applied on the grayscale image to calculate the perimeters of sharp intensity. It could be simply seen that with the perimeters of circles there's some noise returning from background because the background isn't plain. The output

of smart edge detection algorithm offers us the sides of the objects. At this step, albeit circular Hough transform is applied solely circular pattern in the scissor are going to be detected and counted thanks to their circular form however power bank won't be detected as a result of it's not circular in form. The aim of the projected approach is to use circular Hough transform in such way to induce the leads to which all the required objects are detached from one another and at that time employing a generic image process technique e.g. contour detection to count objects regardless of their shapes. thus for the aim of simplification the scissor contour is separated and stuffed internally to be distinguished, albeit the results are often achieved otherwise, we will see that the scissor still has some noise as a section of the coin is hooked up thereto, which might be removed by drawing the contour with a black boundary around it. Within the projected technique, no morphological approach is applied. During this paper, Circular Hough transform is employed not simply solely to find the circular formed objects, however conjointly to draw the closed circles. Inside the contour detection, plenty of circles have unconnected boundaries. Thus by integrating circular hough transform, retrieved circles have a closed contour and at that time circles are stuffed to be visually distinguished, however still the objects aren't completely detached.

Circular Hough transform is once more applied on the already crammed circles whereas creating the circle boundary pixels black for object separation. Output of
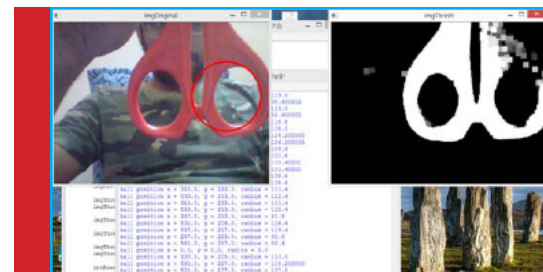
Figure 4. After showing a Red Circular Object (Scissors).
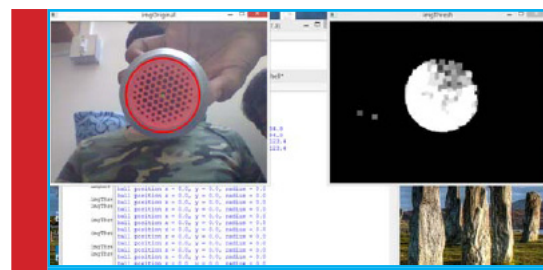
Figure 5. After showing a Red Circular Object (Bluetooth Speaker).
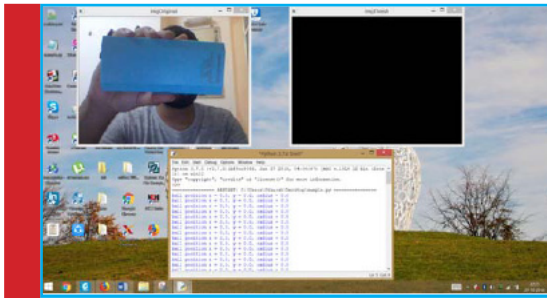
Figure 6. After showing Non-Circular Object (Intex Power bank)
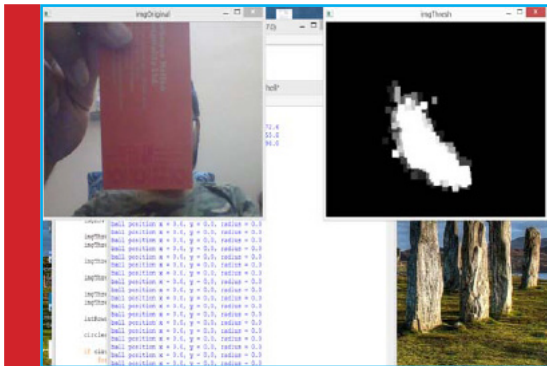
Figure 7. After showing Non-Circular Object (Visiting Card)

Time	Radius
1.1	131.42
1.18	132.42
1.23	96.2
1.24	93.25
1.3	92.20005
1.32	97.245
1.35	108.9
1.4	109.568
1.43	106.23
1.5	106
1.52	107.2
1.57	108.6
1.63	127.852
1.69	124.3
1.74	122.369
1.82	121.455

Figure 8. Radius (in mm) and Time (in ms) entries for the proposed system
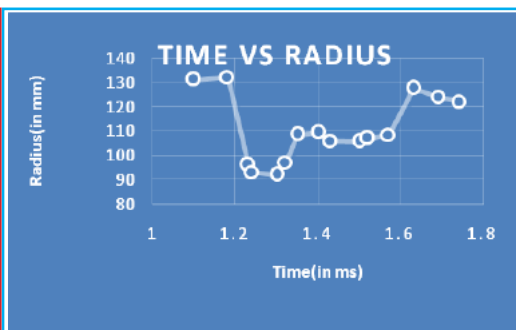
Figure 9. Radius(in mm) vs Time(in ms) entries for various objects used in the project

the subsequent step transforms overlapped objects into fully detach objects and it'll treat one object as a full circle and different object are going to be the remaining part of the entire overlapped space. After that, scissor and speaker are combined on an equivalent image and it's quite evident that each one of the objects are detached. Consistent with the initial statement created, the aim of our planned approach is to detach all the objects. Objects may be circular or any random formed objects hooked up or overlapped with the circular formed objects. Currently as a result of all the objects are detached, they will be counted employing a heap of techniques like blob detection or contour detection. During this study, contour detection is applied to finish the task of object numeration. the ultimate results of the experiment is shown in above figure.

Our technique is healthier than different methods because it'll recognize image and sight the motion of the image at constant time which is able to cut back our time and that we will get the higher output. Once we move the image using numpy library the coordinates also will be displayed on the output screen. By doing this we will sight the image motion and obtain a concept of what's the radius of that specific circular pattern. To additional prove the planned approach's performance, it's compared with the implementation in Matlab and a comparison experiment is applied. We have used OS library from that are able to access the camera and take live pictures that are to be processed that reduces the interval. The average process times of the planned approach supported CV2, numpy and OS strategy enforced in Matlab are 0.32s and 1.38s respectively. Moreover, the planned methodology supported CV2, numpy with OS has outperformed Matlab in process speed, being 5-6 times quicker than Matlab.

Fig 11 illustrates the comparison of the throughput over time for the existing approach and the current approach. As we can the throughput of our system is higher than

Time	Existing System	Proposed System
2.9	3.3	3.4
3.1	3.4	3.45
3.3	3.6	3.7
3.5	3.9	4
3.56	3.99	4.02
3.59	4.03	4.08
3.7	4.05	4.12
3.77	4.17	4.2
3.82	4.23	4.29
3.86	4.3	4.4

Figure 10. Some of the entries of throughput vs time for the existing and the proposed system
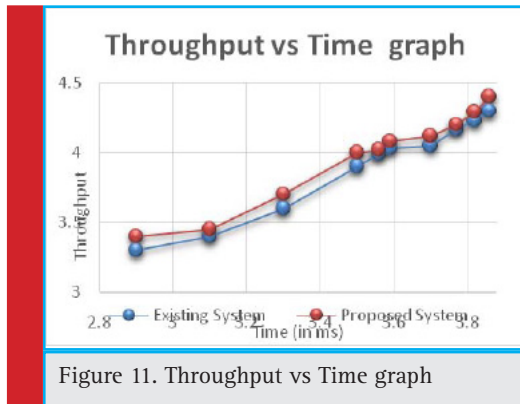
Figure 11. Throughput vs Time graph

the existing system (which used matlab to detect circular patterns) for the same time region. Using CHT with canny edge detection and contour detection made the process of detecting circular objects efficient, reliable as well as less time consuming. We can prefer this technique as it can also get the radius of the desired object in an efficient way. Fig 9 illustrates the radius of the objects over a given time. The clusters observed in the image indicates the approximation of the radius of the objects used in our project over a certain period of time. This performance of the planned approach is incredibly necessary for the pc vision applications in real time operations.

CONCLUSION

In this research work, the enumeration task inside the image is studied, wherever the image has circular formed objects that are overlapping or terribly on the brink of one another, together with some randomly formed overlapping objects. Within the planned approach, all the objects are detected and segmented. In our planned approach, automatic segmentation of various circular formed objects is finished. The experiment results of our approach show the potency of the planned approach. The planned technique are often accustomed solve the matter of detachment of random formed lights connected with the circular formed other objects. As we know, in industries, for the estimation of products infra-red sensors based mostly systems are used. They solely discover the objects however don't have any color data, therefore can't keeping the record of every object individually. Using the planned system objects are generally measured and categorized into completely different colors. The techniques applied inside the system also can be applied to the other circular objects having red color.

REFERENCES

Ballard D. (1981), Generalizing the Hough transform to detect arbitrary shapes, Pattern Recognition, Vol. 13, No. 2, pp.111-122.

Fregin, J. Mueller, and K. Dietmayer (2017), Three Ways of using Stereo Vision for Traffic Light Recognition, IEEE Vehicles Intelligent Symposium, USA, pp. 430-436..

Fursov, V.A., Bibikov, S.A., Yakimov, P.Y., (2013), Localization of objects contours with different scales in images using Hough transform, Computer optics, Vol. 37, No. 4, pp. 496-502.

Guo Mu, Zhang Xinyu, Li Deyi, Zhang Tianlei, and An Lifeng (2015), Traffic light detection and recognition for autonomous vehicles, Journal of China Universities of Posts and Telecommunications, Vol. 22, No. 1, pp. 50–56.

Gevers T. and A.W.M. Smeulders (1999), "Color Based Object Recognition," Pattern Recognition, 32(3), 453–464.

Jiqiang Song and Michael R. Lyu (2005), A hough transform based line recognition method utilizing both parameter space and image, Space Pattern Recognition, Vol. 38, No. 4, pp. 539-552.

Levinson, J. Askeland, J. Dolson, S. Thrun (2011), Traffic light mapping localization and state detection for autonomous vehicles, *Proc. of IEEE Conf. on robotics and automation*, pp. 5784-5791.

Mohanasundram R., Shraddha Chaturvedi, Brijkishore Dutt, (2017) Cloud Based Weather Monitoring System, Journal of Advanced Research in Dynamical and Control Systems.Vol. 09, No. 06, pp. 298-308.

Shun-Hsien Taso (2007), Pedestrian Traffic light recognition For The Visually Impaired, Biomedical Engineering: Applications, Vol. 19, No. 5, pp. 289-294.

Stallkamp J., Schlipsing M., Salmen J., Igel C., (2012), Man vs. computer: Benchmarking machine learning algorithms for traffic sign recognition, Neural networks, Vol. 32, No. 03, pp. 323-332.

Sudhakar B., Bensraj R., (2016), Performance Analysis of Text To Speech Synthesis System Using Hmm and Prosody Features With Parsing for Tamil Language, International Research Journal of Engineering and Technology, Vol. 03, No. 06, pp. 2233-2241.

Ventola, C. L. (2014), Mobile devices and apps for health care professionals: uses and benefits, Pharmacy and Therapeutics, Vol. 39, No. 05, pp. 356-362.

Yuan, S., Chang, S., Uyeno, K., Almquist, G., & Wang, S. (2016), Blood donation mobile applications: are donors ready? Transfusion, Vol. 56, No. 3, pp. 614-621.

Ye Feng, Canjie Chen, Yizong Lai, Jiandong Chen (2014), Orderly based on Hough transform circle detection algorithm is fast, Optics and Precision Engineering, Vol. 22, No. 4, pp.124-135.

Zhang, M., & Liu, Y. (2018), Secure Beamforming for Untrusted MISO Cognitive Radio Networks, IEEE Transactions on Wireless Communications,Vol.17.No.7,pp.4861-4872.

Qin, Z., Gao, Y., & Plumbley, M. D. (2018), Malicious user detection based on low-rank matrix completion in wideband spectrum sensing. IEEE Transactions on Signal Processing, Vol. 66, No. 1, pp. 5-17.

Design of Nanogonal Ring Fractal Antenna for UWB Applications

S. Sivagnanam[1]*, S. Ramesh Kumar[2] and P. Kailasapathi[3]

1,3Department of Electronics and Communication Engineering, Annamalai University, Tamil Nadu, India
2Department of Electrical and Electronics Engineering, Annamalai University, Tamil Nadu, India

ABSTRACT

In this paper, a modified Nanogonal Ring Fractal (NRF) antenna with Triangular shaped slotted ground structure has been provided for multiband Ultra Wide-Band (UWB) wireless applications. To attain an effective and efficient performance of Microstrip patch antenna optimization of fractal iterations, dimensions of the ground plane and Triangular slot on the ground structure were done. A prototype model of the proposed NRF antenna has been fabricated with the optimized results. The Nanogonal ring fractal antenna has been deliberated using FR-4 substrate with the dimensions of $40 \times 30 \times 1.6$ mm3 and simulated with Ansoft High-Frequency Structure Simulator (HFSS) V.14. A range of resonance frequency bands between 3.1-10.7 GHz has been observed for the designed Nanogonal ring fractal antenna. For all resonance frequencies, the Voltage Standing Wave Ratio (VSWR) is less than 2 for the proposed antenna. This ensures maximum antenna efficiency. Microstrip line feed with an input impedance of 50Ω is used and it reveals the omni directional radiation pattern. The simulation outcomes and the optimal fabricated prototype antenna results match closely in performance. The premeditated antenna has the wide range of applications in UWB region. A total of six resonant frequencies have been observed for the proposed NRF antenna.

KEY WORDS: NANOGONAL RING FRACTAL ANTENNA, RETURN LOSS, RADIATION PATTERN, VOLTAGE STANDING WAVE RATIO, WIRELESS APPLICATIONS

INTRODUCTION

The UWB frequency provides utmost data rates along with smallest amount of energy for short-range applications in the field of communication (Fontana 2002). The applications evolve in the fields of Long Term Evolution (LTE) and lately in wireless home networking and Internet of Things (IoT) for next-generation smart phones (N Georgeet et al. 2015). The main downside of Microstrip patch antenna is its narrow bandwidth. This shortcoming does not permit it to be apt for a variety of wireless applications. For this reason, new investigations are highlighted mainly on the area of designing UWB antennas (Sethi et al. 2016).

The complexity in the Microstrip patch antenna design is to have a miniature size and wide bandwidth antenna with the low-cost material. Due to this, the low-cost FR4 substrate having dielectric value 4.4 is used (Wang et al. 2015) in this work. Fractal geometry methodology enhances the performance of Microstrip antenna. The fractal geometry demonstrates the self-similarity concept that incorporates large area and space-filling curves (Gianvittorio et al. 2015). Fractal with repeated structural similarities enables size reduction having multiband characteristics and also proves to be a finer choice for compressed multiband antenna, (Mark et al. 2018).

For UWB wireless applications, different planar curvature fractals having multiband with Koch Sierpinski, (Ramadan et al. 2018) Minkowski and Hilbert were described (Viani et al. 2012). Various shapes of Nested loop geometries along with usual curves and alphabet like fractal dimensions were proposed by present researches (Dorostkar et al. 2013) for design miniaturization of Microstrip patch antenna. These shapes are integrated Defected Ground Structure (DGS), in which the changes on the ground structure is purposely customized to improve the characteristics (Zakaria et al. 2012, Jangid, et al. 2015) of microwave circuits, such as narrow bandwidth, harmonic repression, dimensionality reduction, reduced gain etc (Khandelwal et al. 2017).

These geometries enable the electrons to pass throughout the different lengths that involve in the wider frequency spectrum, multiple bands and reduces the overall structure by 2-4 times. To further minimize the size of the antenna, various ground plane structure modifications are carried out for multiband applications (Gogoi et al. 2016; Anitha, et al. 2016).

In this work, a Nanogonal Ring Fractal antenna has been considered. For design, FR4 substrate with permittivity 4.4 is used. The shape and structure of the bottom plane has been optimized and a triangular slot on the bottom plane has been considered. The design analysis has been done with HFSS simulator and results are validated.

MATERIALS AND METHODS

RF antenna (a) Initiator (b) First Fractal (c) Second Fractal (d) Third Fractal (e) Fourth Fractal
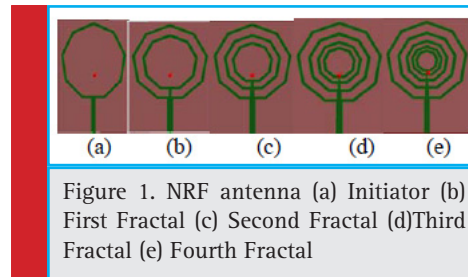
Figure 1. NRF antenna (a) Initiator (b) First Fractal (c) Second Fractal (d)Third Fractal (e) Fourth Fractal

Fig.1 shows the preliminary NRF Fig No 1 showing antenna design using FR-4 Substrate with permittivity 4.4 and height 1.6mm. initially, NRF antenna is designed with a substrate having dimensions ($L_S \times W_S = 40 \times 30$ mm^2) and the ground plane ($L_g \times W_g = 40 \times 30$ mm^2) printed underneath the patch.

The projected NRF antenna design is derived from the principle of self-repeating and self-similarity geometry, (Khandelwal et al. 2017) in which the patch is considered using Nanogonal loops nested within the initiator first Nanogonal ring structure linked with various size of the feed line.

Table 1. shows the Design parameters of proposed NRF antenna. The feed dimensions of all Nanogonal ring structures are given in Table1. The Nanogonal ring strip Width (W_r=1 mm) is assumed as constant in the entire design process. For good-quality antenna performance, the measurements of the ground plane and triangular slots in the ground structure are optimized. Using a log periodic concept, the side length of each Nanogonal ring structure for all stages is calculated by the following equation (R Mark et al. 2018).

$$S_{n+1} = \tau \times S_n \tag{1}$$

Where 'n' denotes the number of iterations and 'S_1' is the first length of Nanogonal side (initiator). Subsequent iterations are attained by multiplying the scaling factor (τ) with an initiator (S_1). The value of scaling factor (τ)=0.734 is optimized for the projected antenna design and its controls the projected antenna dimensions. Fig.2 shows the developmental stages of the NRF antenna structure from initiator to fourth fractal stage.

RESULTS AND DISCUSSION

Initial NRF Antenna Design and Simulation Results

The intended parameters of various steps for the projected NRF antenna are given in Table 1. The various design steps. The design parameters of various steps for the proposed NRF antenna are given in Table 1. The

Table 1. Design parameters of proposed NRF antenna	
Parameters	**Values (mm)**
Substrate length (L_s)	40
Substrate width (W_s)	30
Substrate height (h)	1.6
Ground plane length (L_g)	9.0
Ground plane width (W_g)	13
Initiator ring feed Length (fl_1)	12
Initiator ring feed Width (fw_1)	2.0
First Fractal ring feed Length (fl_2)	2.5
First Fractal ring feed Width (fw_2)	1.5
Second Fractal ring feed Length (fl_3)	1.6
Second Fractal ring feed Width (fw_3)	1.0
Third Fractal ring feed Length (fl_4)	1.0
Third Fractal ring feed Width (fw_4)	0.5
Fourth Fractal ring feed Length (fl_5)	0.5
Fourth Fractal ring feed Width (fw_5)	0.5
Initiator Nanogonal side length(S_1)	9.5
First Fractal Nanogonal side length(S_2)	7.0
Second Fractal Nanogonal side length (S_3)	5.1
Third Fractal Nanogonal side length (S_4)	3.7
Fourth Fractal Nanogonal side length (S_5)	2.7
W_r	1.0
d_1	0.77
d_2	1.0
d_3	1.0
d_4	0.5
T_L	3.46

various design steps involved in the initial design are provided in Fig.1. The simulation for the projected NRF antenna is carried out using HFSS simulator. The performance characteristic of the initial antenna design is evaluated based on its return loss and VSWR. Fig. 2 exhibits the return loss curve for various fractal iterations. In this design, five fractal iterations have been analyzed.

As of the simulation results, it is noted that the Initiator step antenna resonates at 11.6 GHz, which is at the higher frequency side. In order to bring the resonant frequency within the UWB region, additional Fractal iterations have been carried out. The Addition of subsequent fractal ring resulted in shifting the resonant frequency within the UWB region and also with the generation of new resonant frequencies.

As the iterations stages are increased, the antenna dimension decreases resulting in electrical trail length to amplify that alters the resonant frequency on the way to lower frequency surface and offers multiple resonances.
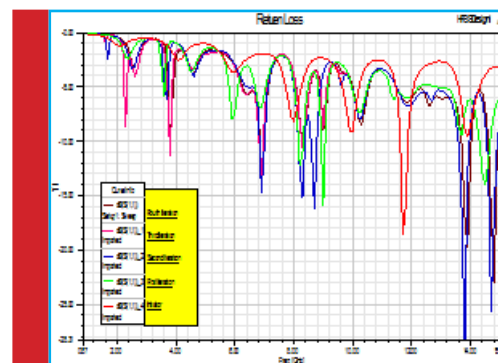
Figure 2. Simulated return loss (S11) of the antenna for different fractal design steps as showed in Fig.1 (a)-(e).
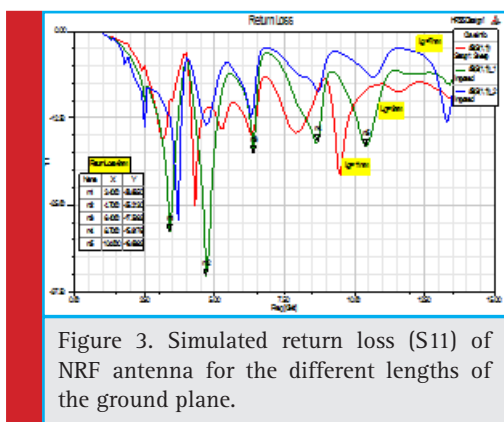
Figure 3. Simulated return loss (S11) of NRF antenna for the different lengths of the ground plane.

Figure 4. Simulated VSWR of NRF antenna for the different lengths of the ground plane.

Table 2 shows the resonant frequencies, a number of resonant frequencies, VSWR, return loss and bandwidth for all fractal iterations. From the results, it has been observed that number of resonant frequencies in second and third fractal iterations is same and larger than an initiator, first and fourth fractal iterations. Hence in initial design, the third fractal ring structure is found to be optimal.

Figure 6. Simulated VSWR of NRF antenna for various lengths of the ground plane.

Effect of Change in Dimensions of the Ground Plane

For optimizing the length (Lg) and width (Wg) of the Ground Plane, initial dimensions of the ground plane 40mm x 30mm were considered. In the first phase of the optimization of the ground plane, the length of the ground plane (Lg) was optimized by keeping the width (Wg) of the ground plane as constant. Three different dimensions for length (Lg) of the ground plane (7mm x 30mm), (9mm x 30mm) and (11mm x 30mm) were analyzed based on number resonant frequencies, return loss and VSWR. From the simulated outputs, it is noted that the optimum Lg was (9mm x 30mm). In the second phase of optimization of the ground plane the optimum length of the ground plane (Lg) was kept constant as 9mm and the width of the ground plane (W_g) was changed and analyzed based on the performance parameters of the antenna (i.e.) number of resonant frequencies, return loss and VSWR. The width of the ground plane (Wg) is varied for dimensions of 11mm, 13mm, and 15mm respectively. For the optimized length of ground plane

Figure 5. Simulated return loss (S11) of NRF antenna for various widths of the ground plane.
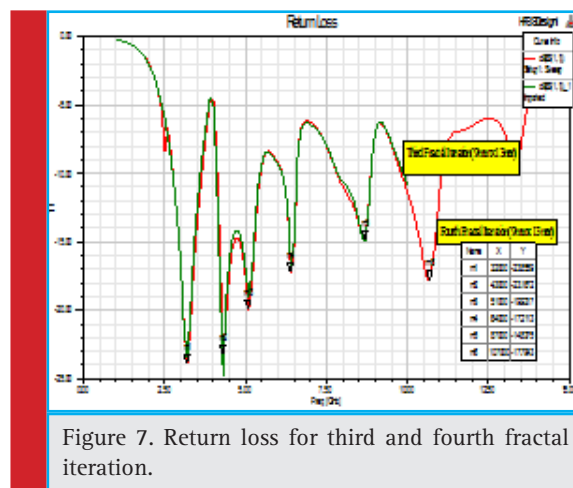
Figure 7. Return loss for third and fourth fractal iteration.

Table 2. Performance parameters of proposed NRF antenna with different ground plane dimensions.						
Fractal Iterations	dimension ground plane (mm)	No. Frequ- encies	Frequency (GHz)	R L (dB)	VSWR	BW (GHz)
Fourth	9 X 30	5	3.4	–28.2	1.07	0.9574
			4.7	–35.2	1.03	0.9689
			6.4	–17.5	1.3	0.3529
			8.7	–15.9	1.38	0.9701
			10.4	–16.6	1.34	1.0354
	9 X 13	6	3.2	–23.8	1.25	0.8930
			4.3	–22.7	1.14	1.3333
			5.1	–19.9	1.4	
			6.4	–17.2	1.1	0.4603
			8.7	–14.8	1.2	1.0500
			10.7	–17.7	1.27	1.2633

9mm, the optimized width of the ground plane (Wg) was found to be 13 mm. The optimized length and width of the ground plane (9mm x 13mm) were chosen for further preceding the design. The simulation results in terms of number of the resonant frequency return loss and VSWR for various lengths and widths of ground plane are exhibited in Fig.3– Fig.6.

In the initial design stage third fractal iteration showed better performance characteristics. Later with optimized length and width of the ground plane, fourth fractal iteration provides better performance character- istics. Hence a comparison among fourth and third frac- tal iterations has been made to select the best fractal design for the proposed NRF antenna. The comparison of Third and Fourth fractal iterations are shown in Fig.7 and Fig.8.

Table 2 reveals the performance parameters of pro- posed NRF antenna for optimum ground plane design. From comparing third and fourth fractal iterations, it has been observed that VSWR for both fractal iterations is identical and less than 2. But the number of resonant frequencies for third fractal iteration is less than that of the fourth fractal iteration. Fourth fractal iteration provides better performance for (9mm x 13mm) ground plane. Hence Fourth fractal iteration of NRF antenna is chosen for the proposed design.

Proposed NRF Antenna with Defected Ground Structure

The projected NRF antenna with a triangular slot on the ground plane is shown in Fig.9. To further enhance the performance characteristics of the NRF antenna, trian- gular slots on the optimized ground plane have been introduced and analyzed. The introduction of triangular slots has been adopted for further reduction of the size of the projected NRF antenna. The dimensions of the triangular slots are given in Table 1. The simulated per-
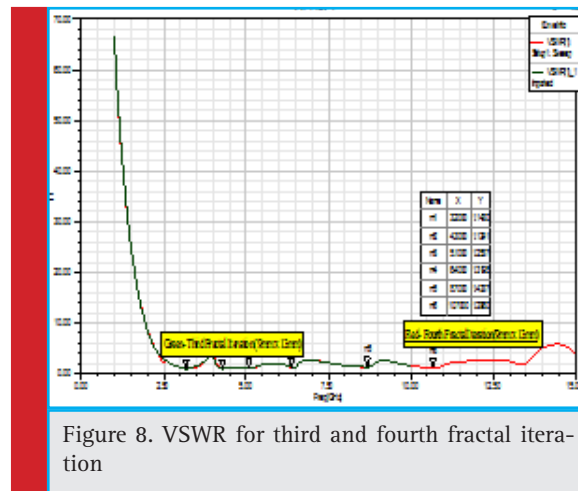
Figure 8. VSWR for third and fourth fractal itera- tion

formance characteristics of the projected NRF antenna having triangular slot are given in Fig.10 – Fig.13.

Table 3 reveals the characteristics of the projected NRF antenna with the triangular slot. Simulation results prove the effectiveness of the projected NRF antenna. The radiation pattern is unidirectional and the gain
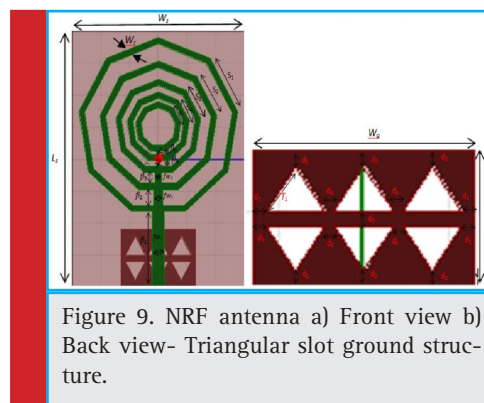
Figure 9. NRF antenna a) Front view b) Back view- Triangular slot ground struc- ture.
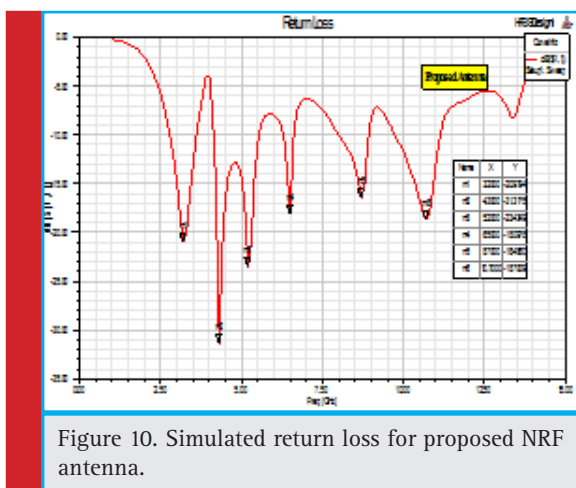
Figure 10. Simulated return loss for proposed NRF antenna.
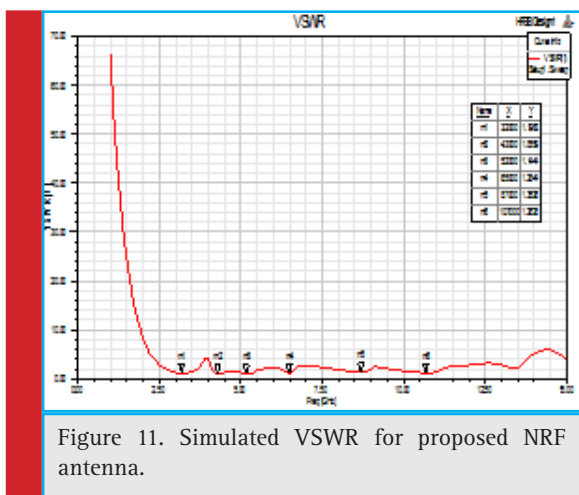
Figure 11. Simulated VSWR for proposed NRF antenna.

value is 9.65 dB. Six numbers of resonant frequencies have been observed. The return loss values are minimum and the VSWR values are less than two. The simulation results of the projected NRF antenna with and without triangular slots are almost similar. But with triangular slots on the ground plane the size of the NRF antenna
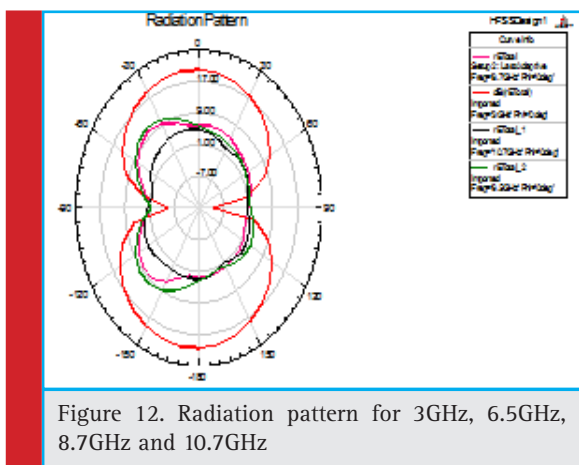
Figure 12. Radiation pattern for 3GHz, 6.5GHz, 8.7GHz and 10.7GHz
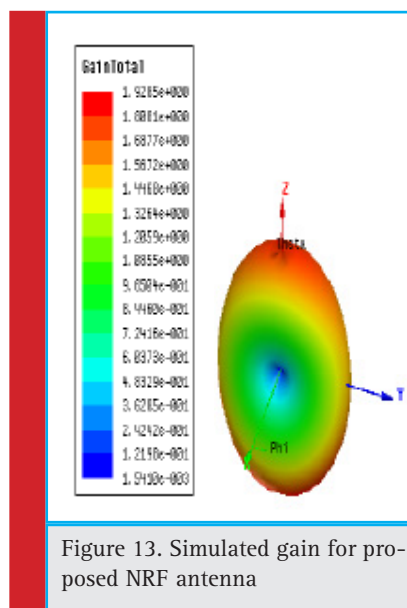
Figure 13. Simulated gain for proposed NRF antenna
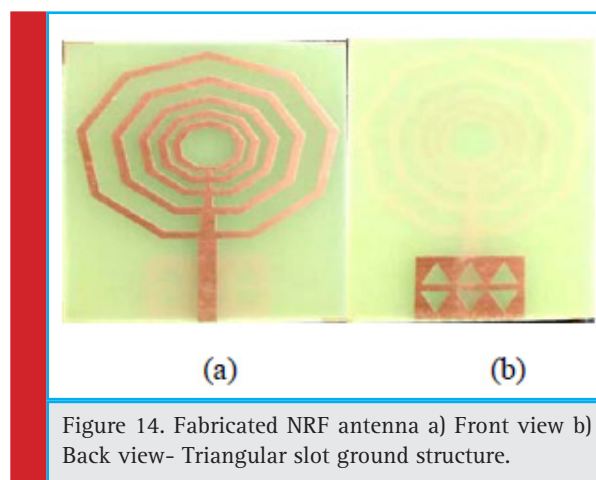
Figure 14. Fabricated NRF antenna a) Front view b) Back view- Triangular slot ground structure.

has been greatly reduced with one additional resonant frequency. This reduced size and enhanced performance of the NRF antenna makes it a valuable candidate for several wireless applications in UWB region.

RESULTS AND DISCUSSION

The proposed prototype NRF antenna with optimized dimensions having triangular slot has been fabricated. The Fabricated model of NRF patch antenna is displayed in Fig. 14. The prototype NRF antenna Performance parameters are measured using Agilent N9918A vector network analyzer.

From the measured results five different resonance frequencies were observed. Near the resonance frequency, the matching impedance value is around 50 ohms for the prototype antenna as shown in Fig 16. Measured radiation patterns of the projected NRF antenna are
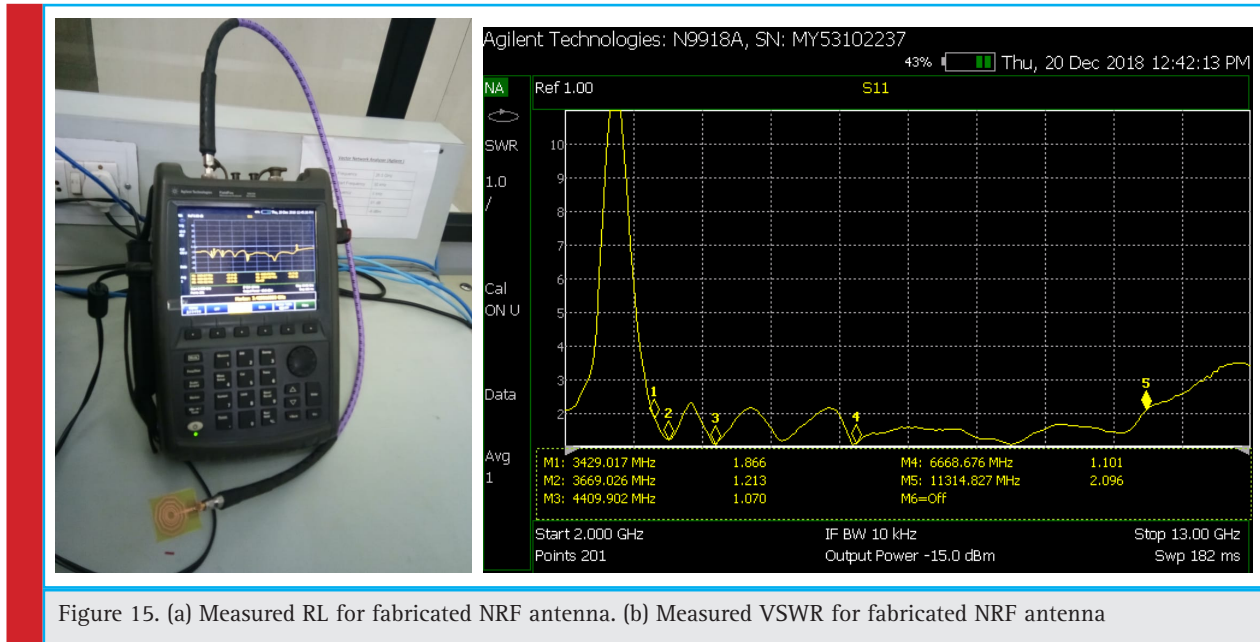
Figure 15. (a) Measured RL for fabricated NRF antenna. (b) Measured VSWR for fabricated NRF antenna

Table 3. Performance characteristics of the proposed NRF antenna with triangular slot.

Fractal Iterations	Resonance Frequency (GHz)	Return Loss (dB)	VSWR	BW (GHz)
Proposed NRF Antenna with a triangular slot	3.2	-20.9	1.1	0.8263
	4.3	-31.3	1.0	1.4107
	5.2	-23.4	1.1	
	6.5	-18.0	1.2	0.3244
	8.7	-16.4	1.3	0.9323
	10.7	-18.70	1.2	1.1005

revealed in Fig.17. Omni directional characteristics radiation patterns were observed for both E plane and H plane at 4.1GHz, 5.6GHz and 6.7 GHz.Table.4 exhibits the evaluation result of simulated and measured NRF antenna in terms of Resonance frequency, return loss and VSWR.

Figure 16. Smith chart plot for fabricated NRF antenna

Figure 17. Measured E-plane((a) - (c)) and H-plane ((d)-(e)) Radiation patterns of Fabricated antenna For 4.1 GHz, 5.6 GHz and 6.7GHz.

CONCLUSION

A compact Nanogonal Ring Fractal antenna has been designed and fabricated on FR-4 substrate for UWB wireless applications. Five resonant frequencies are attained by optimizing the number of Nanogonal rings. The

Table 4. Comparisons between simulated and measured results of proposed NRF antenna.

Simulated Results			Measured Results		
Resonance Frequency (GHz)	Return Loss (dB)	VSWR	Resonance Frequency (GHz)	Return Loss (dB)	VSWR
3.2	–20.9	1.1	3.4	–18.54	1.2
4.3	–31.3	1.0	4.4	–26.54	1.3
5.2	–23.4	1.1	5.2	–23.6	1.7
6.5	–16.4	1.2	6.6	–27.29	1.0
8.7	–18.7	1.3	8.8	–25.3	1.2

dimensions of the ground plane of the NRF antenna has been optimized and triangular slots have been introduced to achieve wide bandwidth and enhanced performance characteristics. Size of the antenna has been minimized allowing for its use in wireless applications. The resonant frequencies of the proposed NRF antenna lies between 3.2GHz and 10.7 GHz and the antenna can efficiently transmit in ultra wideband regions. The performance parameters of prototype model closely matches with the simulated results. The NRF antenna can be effort lessly added with other microwave devices and straightforward to put together as both ground plane and the radiating patch as on the similar plane of the substrate.

REFERENCES

Anitha, P., Reddy, A.S.R. and Prasad, M.G., (2018), Design of a Compact Dual Band Patch Antenna with Enhanced Bandwidth on Modified Ground Plane, International Journal of Applied Engineering Research, Vol. 13, No.1, pp. 118-122.

Dorostkar, M.A., Islam, M.T. and Azim, R., (2013), Design of a novel super wide band circular-hexagonal fractal antenna, Progress In Electromagnetics Research, 139, pp. 229-245.

Fontana, R.J., (2002), A brief history of UWB communications. Multispectral. Com, Multispectral Solutions, Inc., www.multispectral. com/history. html.

George, N. and Lethakumary, B., (2015), A compact microstrip antenna for UWB applications, Microwave and Optical Technology Letters, Vol. 57, No. 3, pp. 621-624.

Gianvittorio, J.P and Rahmat-Samii, Y, (2002), Fractal antennas: A novel antenna miniaturization technique, and applications, IEEE Antennas and Propagation magazine, Vol. 44, No. 1, pp. 20-36.

Jyoti Gogoi, P., Jyoti Gogoi, D. and Bhattacharyya, N.S., (2016), Modified ground plane of patch antenna for broadband applications in C-band. Microwave and Optical Technology Letters, Vol. 58, No. 5, pp. 1074-1078.

Jangid, K.G, Sharma, V, Sharma, R, Saxena, V.K, Bhatnagar, D. and Kulhar, V.S, (2015), Design of Compact Microstrip Patch Antenna with DGS Structure for WLAN & Wi-MAX Applications, European Journal of Advances in Engineering and Technology, Vol. 2, No.1, pp. 8-11.

Khandelwal, M.K., Kanaujia, B.K. and Kumar, S., (2017), Defected ground structure: fundamentals, analysis, and applications in modern wireless trends, International Journal of Antennas and Propagation, Vol. 2017, pp. 1-12.

Mark, R., Mishra, N., Mandal, K., Sarkar, P.P. and Das, S., (2018), Hexagonal ring fractal antenna with dumb bell shaped defected ground structure for multiband wireless applications, AEU-International Journal of Electronics and Communications, 94, pp. 42-50.

Ramadan, A.H., Kabalan, K.Y., El-Hajj, A., Khoury, S. and Al-Husseini, M., (2009), A reconfigurable U-Koch microstrip antenna for wireless applications. Progress in Electromagnetics Research, 93, pp. 355-367.

Sethi, S. and Mehta, E.M., (2016), Microstrip Patch Antenna for UWB Applications: An Overview, International Journal of Engineering Science, Vol.06. No. 06, pp. 7501-7504..

Viani, F., Salucci, M., Robol, F. and Massa, A., (2012), Multi-band fractal Zigbee/WLAN antenna for ubiquitous wireless environments, Journal of Electromagnetic Waves and Applications, Vol. 26, No. 11-12, pp. 1554-1562.

Wang, L, Zhang, R, Zhao, C.L, Chen, X, Fu, G. and Shi, X.W., (2018), A Novel Wide-Band Miniaturized Microstrip Patch Antenna by Reactive Loading.,Progress in Electromagnetics Research, Vol. 85, pp. 51-62.

Zakaria, Z, Shairi, N.A, Sulaiman, R. and Sam, W.Y, (2012), Design of reconfigurable defected ground structure (DGS) for UWB application. in Applied Electromagnetics (APACE), IEEE Asia-Pacific Conference pp. 195-198.

BBRC

Bioscience Biotechnology
Research Communications

A Low-Cost Cloud based Smart Flood Detection and Alert System

S. Murali[1]*, K.R. Jothi[2], R. Lokeshkumar[3], S. Anto[4] and G. Ravikumar[5]

[1,2,3,4] *School of Computer Science and Engineering, Vellore Institute of Technology (VIT), Vellore, India*
[5] *Department of Computer Science and Engineering, Coimbatore Institute of Engineering and Technology, Coimbatore, India*

ABSTRACT

Among the numerous natural disasters, floods is an overflow of water that can destroy many lives and society. It occurs mainly due to heavy rainfall and dam overflow. It affects in highly manner to people's lives and area; hence government would end up spending more resources to recover the affected region. Therefore it becomes crucial to develop a flood detection system that spreads awareness to the society about the rise in water level to potential flooded region. The system is designed with the help of raspberry pi and different sensors that play an important role in gathering timely information from water sensor unit. The Way2SMS API is used for sending alert message to the people that also helps in delivering messages in the case of no internet connectivity. Calling feature is also developed that notify people in case of flood emergency at night. The objective of the project is to design a system that can measure the rise in the water level and take water flow readings with the help of water level sensor and water flow sensor and then effectively spread the information to the society such that the necessary actions can be taken at the early stage. Thus the efficiency of the system helps in preventing materialistic as well as human loss by sending early alert information.

KEY WORDS: FLOOD ALERT, WATER LEVEL SENSOR, WATER FLOW SENSOR, RASPBERRY PI, IOT

INTRODUCTION

There are various natural calamities among which flood is considered as informal way of water overflow caused by any odd means of reasons such as heavy rainfall or

different hazardous conditions. The major such conditions are hydrological condition, metrological condition, geographical condition, topographical condition and also sometimes planning problems can cause flood, too (Priyadarshinee et al. 2015). Among which hydrologi-

cal condition is the most common reason behind flood i.e. heavy rainfall and discharging surplus water. Metrological condition is storm and any untimely changes in cycle (Zhang et al. 2018).

Geographical conditions have water-flow from state-to-state and planning problems contain high siltation in river, poor drainage systems etc. Flood can affect many lives and society in different ways. Floods are categorized based on its behaviour. The types of flood are: Coastal flood (Surge), River flood (Fluvial) and Surface flood (Pluvial) (Windarto, et al. 2010).

Coastal Flood (Surge)

It lies in the sea-line areas or coast-line areas where the flood occurs due to some extreme tidal changes because of weather conditions. The major cause for this type of flood is storm surge because of which the water overflows to the lower areas.

River flood (Fluvial)

This happens due to heavy rainfall and then rivers overflow. This flooding type is also categorized in two ways: Overbank flooding that occurs due to the water level rising and then it surpasses its edge. Flash flooding is considered to be the most dangerous one because it comes with short notice and also with high water force. This occurs due to rapid tidal changes mostly high velocity that can destroy small villages or towns.

Surface flood (Pluvial)

This generally occurs to urban areas irrespective of the water flow of any river or pond. This happens due to heavy rainfall and planning conditions that contains water-logging or saturated drainage systems.

Flood can affect in highly manner to people's lives and area; hence government would end up spending more resources to recover the affected region. So that flood detection plays a major role in order to take necessary prevention steps for saving many lives and valuable properties. There are many flood alert systems developed in many countries which may require much expertise or can cost more for the maintenance and monitoring purpose. In this paper, we have described different types and causes of floods in section I. Section II surveys on different techniques used for various flood alerting systems with some of its drawbacks. Section III describes the proposed methodology and how the system is developed and its working. Section IV contains results. The last section V concludes the paper and proposes future enhancement work.

There are many flood alert techniques and monitoring systems developed in order to save people's lives and to prevent damage. The difference lie beneath those systems i.e. the techniques used behind it and the predicting

models for sending alert messages to relocate the people to the safety zone. This survey comprises of few papers on flash flood monitoring system, MyFMS, user mobility based flood alert system, early flood monitoring system, ShonaBondhu for Bangladesh and grid based flood monitoring system.

The authors (Intharasombat et al. 2015) have proposed the system particularly for flash flood which contains an android module that captures a photograph after the water level goes high beyond some threshold value. In further process, the data is collected from this module that comprises of photographs and also the readings of temperature and echolocation sensors. The collected data is sent to server for further analysis process of flash flood detection. The system they developed comprises of Echolocation sensor, Temperature sensor, IOIO board, Camera, Android system and server as backbone. The bottleneck of the system is their high dependency on android module which is assumed to be powerful here.

The authors (Baharum et al. 2011) have developed the flood monitoring system called MyFMS. Their system contains an application that will display the sensor reading if the water level crosses the threshold value and with that it generates the text file of it to alert the local authorities. If the water level reaches to the dangerous point then SMS is sent to the users for the reminder of the current water level state. For the work-flow of the system, they have used water sensor, monitoring of the water level using it SMS gateway for sending alert messages. The benefit of the system is its flexibility, performance and cost, but the drawback of the system is their liability over GSM.

The authors (Fateen Atiqah Mastor et al. 2015) in this paper have proposed the method that contains three phases i.e. water level monitoring, keeping track of the real-time water level status and broadcasting alert messages through MTSO based on users' mobility. The system gives better performance in case of rainfall driven flood. The system uses the ultrasonic sensor and based on the level status only the SMS will be broadcast only to the users who come under the affected BS region. The major drawback of the system is that the sensor may get affected as well as the mobile towers may fail during heavy rainfall.

The authors have proposed a model-driven approach that is based on prediction of flood so that at early stage necessary actions can be taken (Elizabeth Basha et al. 2007). In this, the sensor nodes are deployed to a river bank for getting the real-time data and for flood prediction, multiple linear regression method is used in order to get accurate computation. Their proposed system comprises of flow sensors, temperature sensor, rain sensor for the external sensing and sending the collected information to the community.

For the prediction phase, it requires different parameters such as soil moisture, soil composition along with weather conditions to know the rainfall measures, so the model requires number of sensors that can affect to the cost of the system as well as computations, which is also the drawback.

A Bangladesh based Shona Bondhu system is proposed by (Ahmed et al. 2016). This system contains 3 major phases. The first phase cloud server which is useful for getting long term data for better forecasting reports to make better strategies for taking necessary actions. The second phase is all about making real time decisions and forecasting with the help of local water level gradient information. This phase is known as gradient server that comprises of various local servers. The third phase contains deployment of water level sensors and monitoring the real-time data. Their system is actually deployed with a collaborative effort with Water Development Board of Bangladesh.

The working of the system starts with the sensing of the data using water level sensors. As per the water level status and rainfall measurements, the gradient information is updated and sent over cloud server for further analysis and sending alert status. Here the liability is mainly on the servers that require high speed internet which can create a problem during heavy rainfall. That is the drawback of the system. Also the main liability stands in the hands of government as data is collected by them and it's in their hands to deliver the message to people.

The authors (Danny Hughes et al. 2016) have proposed a better performance oriented approach using grid based monitoring system. This system makes use of both local as well as remote sensor network (Seal et al. 2012) They have proposed to make use of GridStix sensor platform that contains grid middleware, hardware embedded and heterogeneous wireless network. The system performs local computations that include different sensors and predictive analysis based on images. But this can also be the drawback of the system as the series of such image transfer can create bottleneck for GSM technology. Also the suggested platform comprises of many embedded computing specifications that can affect the cost of the system (Sakib et al. 2016).

Here are the drawbacks mentioned of these existing systems in a tabular format.

MATERIALS AND METHODS

PROPOSED METHODOLOGY

Figure 1 shows our proposed implemented model. The model comprises of Raspberry pi module, two sensors i.e. water level sensor and water flow sensor, motor, LED (red, green, yellow) and buzzer.

Existing System	Drawbacks
Flash Flood Monitoring System	Their higher dependency on their Android module as well as photos taken from their camera that might get affected based on weather situation.
MyFMS	Their major liability on GSM module.
Pre-flood Warning System	Due to heavy rainfall mobile towers may fail and also ultrasonic sensors may produce wrong results because of external sounds.
Early Warning Flood Detection System	Their complex computation and prediction based on rainfall driven approach for gathering soil parameters; also high cost of the system.
ShonaBondhu	Their complete liability on 3 planes and servers that require high speed internet that becomes critical at the time of flash floods. Moreover, both monitoring and alerting is handled by government that can be time consuming for reaching to all people in crucial times.
Grid Based Monitoring System	Its complex architecture and high power consumption plus series of image transfers can be a bottleneck of GSM module.

The water level sensor indicates the increase in the water level as shown in figure 3. With each level LEDs glow to indicate the sign of safe, moderate and high i.e. green, yellow and red. When the water level reaches to the third level, buzzer sound will come up to show the high alert. Another sensor is water flow sensor that measures the flow of the water. With the high alert indi-

Figure 1. Proposed flood alert system

Figure 2. Setup for measuring water level using water level sensor

Figure 4. Putty console

Figure 6. SMS-Alert notifications and call-alert notification

Figure 3. Setup of implemented modal

cation, the motor moves which is used as the prototype of damn gates i.e. to take the decision of open/close damn gates with respect to the level of water.

All these readings are sent over real cloud server and reading logs are displayed over web console. The cloud storage is required as the data logs are continuously monitored by the admin. So the web console helps in monitoring the water conditions and becomes the deciding factor in the analysis of flood alert system. Sometimes during flood conditions, in the rural area the internet connectivity is lost because of power issues. Hence, many lives come at stake if administration department fails to inform to all areas in time. So our proposed method includes delivering SMS to the people registered under nearby areas even in the case of no internet connectivity. We have made use of Way2SMS API for sending SMS incorporated with a python script to the raspberry pi. So when the water level reaches to the high level, the system will send the high alert message to the people, so that they can follow the guided things in order to rescue from the flood conditions.

Also, we have included the scenario where at night time; people cannot rely on SMS alert notification while they are asleep. For such scenario, call-alert feature is developed that provides stronger calling notification to the people in case of flood emergency at night. The implementation proposed model as shown figure 3.

RESULTS AND DISCUSSION

As the result of the developed modal for flood detection system, we have collected readings from putty console, and then all generated logs from web console for flood monitoring and at the end SMS-alert as well as call-alert outputs as the part of flood alerting.

LogID	DATA	Logdate	LogTime
	Click Here To Delete Logs CLEARLOG		
1		12/11/2017	14:59:55
2	123	12/11/2017	15:00:17
3	Waterlevelhigh	12/11/2017	15:11:22
4	WaterFlow	12/11/2017	15:11:23
5		12/11/2017	15:11:23
	153		
7	Waterlevelhigh	12/11/2017	15:11:27
8	WaterFlow	12/11/2017	15:11:28
	155		
10	Waterlevellow	12/11/2017	15:11:31
11	WaterFlow	12/11/2017	15:11:34
	155		
13	Waterlevelmedium	12/11/2017	15:11:38
14	WaterFlow	12/11/2017	15:11:38
	154		
16	Waterlevellow	12/11/2017	15:11:42
17	WaterFlow	12/11/2017	15:11:43
	155		
19	Waterlevelhigh	12/11/2017	15:11:47
20	WaterFlow	12/11/2017	15:11:48
	154		
22	Waterlevellow	12/11/2017	15:11:52
23	WaterFlow	12/11/2017	15:11:53
	155		

Figure 5. Logs monitoring from web console

As discussed, the results from the developed model are shown below. Figure 4 shows results from putty console.

Figure 5 shows result of logs monitoring from web console.

The Figure 6 shows SMS-Alert notifications via Way-2SMS API and Call-Alert notification.

CONCLUSION

This paper represents how early flood detection takes place using raspberry pi by collecting data with the help of water level and flow sensor and then taking appropriate action like enabling motor and sending alert message. The paper concludes with showing data logs to the cloud server for the flood monitoring as well as the system is reliable in terms of sending alert messages to the registered area people. The advantage of the system is the flood monitoring system with the SMS notification to the each people in timely manner even under no internet connectivity conditions as well as it has Call-Alert feature that's more effective in case of night-time flood emergency when majority people are asleep. The drawback of the system lies behind the weather conditions and how that can affect the sensors.

Because raspberry pi is called a mini computer because of its many features, the future enhancements of this project can comprise of taking pictures of the situations under different weather conditions and further applying machine learning techniques for flood predictions.

REFERENCES

Ahmed, N A.K. Azad, Mahmudur Rahman Khan, Ahsan Habib, Shuvashish Ghosh, Sabiha Shahid, ShonaBondhu (2016), A Cloud Based System to Handle Flash Flood, **in** International Conference on Networking Systems and Security (NSysS), Bangaladesh, pp. 1-7.

Ashok V. Janarthanan, Mohanasundaram R., (2017), Certain investigations on ec-a algorithm for energy Minimization in multiprocessor systems, Journal of Advanced Research in Dynamical and Control Systems Vol. 09, No. 06, pp. 281-290.

Baharum M.S., Awang and Baba N.H., (2011) "Flood Monitoring System (MyFMS), IEEE International Conference on System Engineering and Technology (ICSET), Malaysa, pp. 204-208.

Danny Hughes, Phil Greenwood, Gordon Blair, Geoff Coulson, Florian Pappenberger, Paul Smith and Keith Beven, (2006), An Intelligent and Adaptable Grid-based Flood Monitoring and Warning System, Vol. 05, No. 02, pp. 123-135.

Elizabeth Basha, Daniela Rus, (2007), Design of Early Warning Flood Detection Systems for Developing Countries, **in** International Conference on Information and Communication Technologies and Development, Bangalore, India, pp. 1-10

Fateen Atiqah Mastor, Izzatdin A Aziz, Nornazatul Natrah Ismail, Mazlina Mehat, Nazleeni Haron, Ade Wahyu, (2015) ,Conceptual Design of Pre-Flood Warning System Based on User Mobility, International Symposium on Mathematical Sciences and Computing Research (iSMSC), Malasya, pp. 132-137.

Gopinath M.P., Aarthy A.L., S. Prabu, (2017), Visualising the extracted features of face images using LBP And LTP, Journal of Advanced Research in Dynamical and Control Systems Vol. 09, No. 06, pp. 254-262.

Priyadarshinee, I Kabita Sahoo, Chandrakant Mallick, (2015), Flood Prediction and Prevention through Wireless Sensor Networking (WSN): A Survey, International Journal of Computer Applications, Vol. 113, No. 09, pp. 0975–8887.

Johnston, M. J., King, D., Arora, S., Behar, N., Athanasiou, T., Sevdalis, N., & Darzi, A. (2015), Smartphones let surgeons know WhatsApp: an analysis of communication in emergency surgical teams, The American Journal of Surgery, Vol. 209, No. 1, pp. 45-51.

Mohanasundaram R., N. Suresh Kumar, V. Ashok and S. Poorani, (2017), Congestion Contol Using Congestion Free Routers, International Journal of Pure and Applied Mathematics, Vol. 117, No. 15, pp. 287-298.

Ouychai Intharasombat, Paween Khoenkaw, (2015) A Low-Cost Flash Flood Monitoring System, 7th International Conference on Information Technology and Electrical Engineering (ICITEE), Chiang Mai, Thailand, pp. 476-479.

Seal, V., Raha, A., Maity, S., Mitra, S. K., Mukherjee, A. and Naskar, M. K. (2012), A Simple Flood Forecasting Scheme Using Wireless Sensor Networks, International Journal of Ad hoc Sensor & Ubiquitous Computing, Vol. 3, No.01, pp. 45-60.

Sakib, SN Tanjea Ane, (2016), An intelligent flood monitoring system for Bangladesh using wireless sensor network,

5th International Conference on Informatics, Electronics and Vision (ICIEV), pp. 979-984.

Windarto, J. (2010), Flood Early Warning System develop at Garang River Semarang using Information Technology base on SMS and Web, International Journal of Geomatics and Geosciences, Vol. 01, No. 01, pp. 35-43.

Zhang, M., & Liu, Y. (2018), Secure Beamforming for Untrusted MISO Cognitive Radio Networks. IEEE Transactions on Wireless Communications, Vol. 17. No. 7, 4861-4872..

Qin, Z., Gao, Y., & Plumbley, M. D. (2018). Malicious user detection based on low-rank matrix completion in wideband spectrum sensing. IEEE Transactions on Signal Processing, Vol. 66, No. 1, pp. 5-17.

BBRC
Bioscience Biotechnology
Research Communications

Web application for Accident Emergency in Nearby Hospitals and Donor Locator

R. Mohanasundaram[1]*, R. Arun[2], K.R. Jothi[3], Ankit Malhotra[4], M.P. Gopinath[5] and R. Lokeshkumar[6]

[1,3,5,6]*School of Computer Science and Engineering, Vellore Institute of Technology (VIT), Vellore*
[2]*Builders Engineering College, Kangeyam, Tamil Nadu*
[4]*School of Electrical Engineering, Vellore Institute of Technology (VIT), Vellore, Tamilnadu*

ABSTRACT

Emergency services at the time of road accidents are crucial for rescuing people in need of critical medical attention. Most road accidents lead to deaths when the victims don't make it to the hospital in time or when his requirements aren't met in a short period. Involving smartphones in the field of emergency medical services can boost the quality of service that the victims receive. It is usually very difficult to find donors of blood and organs during the time of critical treatment. Finding a good hospital service in an unknown geographical location is also a major challenge. A smartphone app to deal with these issues can serve as a big leap in the field of medical service for road accidents. The proposed Web application provides the user with the list of all hospitals present in the nearest location with the help of GPS. It also gives an option to view the list of nearest blood and organ donors who are eligible. It works as a donation community among the donors and victims. This app would hence save a lot of time and effort in finding emergency medical service. This might save a lot of lives in need during the time of emergency and make the work easier for the blood donation centers and the hospitals.

56

INTRODUCTION

The number of casualties in road accidents is increasing every day. Survey indicates about 17 road accident fatalities every hour. The major reason is that these victims don't receive the medical attention they need in sufficient time. The web application developed can reduce the time taken for receiving medical service by immediately providing details of nearby hospitals and the list of nearby blood and organ donors. The location of the victim is identified through the use of GPS at first. The location details are used to identify the nearby hospital locations which the user can choose from. This is done with the help of Google maps API. The information of the donors that the donors frequently post is also displayed when the user is in need of donors. This helps in a quick communication. This information is regularly updated in the database as the users keep posting donor details. The user can hence easily choose eligible candidates based on that. Making a simple UI for the app, it would serve as a user friendly system that any smartphone user could use without the geographic location, the age, the language spoken being a barrier. The web application is simple and does not require a lot of resources. The details and ratings of the hospitals are also mentioned to help the user choose the convenient one from the others.

MATERIALS AND METHODS

(Kumar et al. 2016) studies and observes the features of smartphone applications for Blood Donation by taking in consideration, their features and applications. Conducting a survey on smart phone applications available in different smartphone platforms, it was observed that more than 180 Apps are present that help in blood donation awareness and donation service. However, the Apps available are mostly available for android Operating System. This indicates a demand in the App in other platforms such as IOS and Black Berry.

On analyzing, it was clear that most of these applications served the purpose of helping the users select the blood donors among the database of the available donors that were displayed. Majority of the Apps present are Multilingual and user friendly. However, some of the apps do not pose availability in all regions and some of them do not have a user notifications service when there is an availability of doors or if there are requests

(Dayer et al. 2013) studies and observed that one of the apps has the unique feature of connecting to a blood donation lab. More than a quarter of these apps allow the connection of social media applications like Facebook for a wider reach for the users. It concludes that blood donation apps must have more features added in order to increase more donors.

(Ouhbi S et al. 2015) proposed a system that there has been a fall in the level of organ donors in the last few years due to the inconvenience and discomfort in live organ donation that occurs face to face. It makes the people more shy and hesitant to request total strangers for organ donations. A survey was conducted among the organ affected people and it was observed that more than half of them used social networking apps. They used this with ease since the User interface was simple and easy to handle. They were also connecting to people around the world at ease. Hence an App for organ donations would make the process of requesting for organs and approving the requests less awkward

(Mostafa et al. 2014) claims that an organ donating app based on social networking would be used popularly and be easy to handle and make use of for many users around the world. This study highlights the importance of blood and organ donation at the time of emergencies such as road accidents. There have been global actions taken to make use of mobile applications and social media to push the availability of blood and organ donors at crucial emergencies and to make the service more convenient and to create a chain of donors during the time of crisis.

(Yuan et al. 2016) observes that blood and organ donation service is a time consuming service that includes the communication between the donor, victim, the medical center and the donation center.

Sometimes the integration between these modules is weak or missing and hence the time and effort taken during the emergencies are long and could even lead to casualties. In addition to this, most of the blood banks work independently and aren't part of communities. The proposed service initiates a mobile based and cloud based service where the information that is dispersed are brought together over the cloud and provided to the app users through the apps.

Recently, Charani et al. (2018) proposed a system for the users to get notified during the time of emergency blood donation calls and gives them the information of the nearest blood donation centers. It also allows them to community with the other donors via the use of social media sites.On surveying almost a 1000 donors from different geographic regions, different age groups and multilingual ones, it was noted that more than 85 percent of them used smart phones. Only a small percentage of them communicated with the blood donation camps via text to email. Most of the app features allow users to get appointments and contact the medical services.

Faiz et al. (2015) had proposed that the features requested by the users are to get notifications during availability of services and a more emergency based service, like the availability of hospitals in the nearby radius. Donors who are presently using telephones and

texts are more in need for an app that helped them contact in need. Donors below the age of 45 were keen towards the app than the other age groups King et al. (2015) proposed the alert message is often sent to every donor available at a maximum radius. This creates confusion and chaos among the donors and the victims. This must be prevented by sending the alarm only to the nearest donor who is found actively using the app and is eligible for the donation.

West et al. (2012) introduced a technique to ensure authenticity of the person requesting is also required. This is important because it could prevent the false calls that could be often fake and might cause a lot of frustration among the donors and the hospitals.

Emergency helplines haven't been so useful during critical conditions at times. They usually contact the nearest government hospital which could be at a long distance at times. The patient or the victim might at times want to know the best service available at the nearest location. The ratings and distance of every hospital available near the victim is requested as a feature in most emergency applications.

A community of people using this application could also post their feedback of hospitals which would guide the users choose the best service. These are some of the major features that users request in the application that is dedicated for emergency medical services. Road accidents are a major threat that causes deadly injuries or even gets lethal at unfortunate times. Ventola et al. (2014) proposed that insufficient time and requirement of critical treatment during the time of an accident are the most popular reasons for deaths from road accident. Absence of help during the time of accidents could also lead to unattended victims.

The research studies an android app that detects an accident and sends an alert to the nearest hospital, and hence requests for medical service at the location of the accident. The app makes use of GPS and accelerometer to detect the location of the accident and send an alert when there is a collision. By ensuring the speed at which the car was travelling, the app prevents alerting for a small collision that is inconsiderate.

Objectives

- There aren't many emergency health service applications available
- Currently there aren't many applications that solve the problem statement
- The existing applications have a lot of lagging features
- No current efficient system for organ and blood donor communications
- An application that fulfills the problem could prevent a lot of road deaths

Problem Statement

A system to reduce road accident fatalities by implementing a method to show the user, the nearby hospitals and blood and organ donors along with their details to reduce the time taken for medical service to be provided.

SYSTEM DESIGN
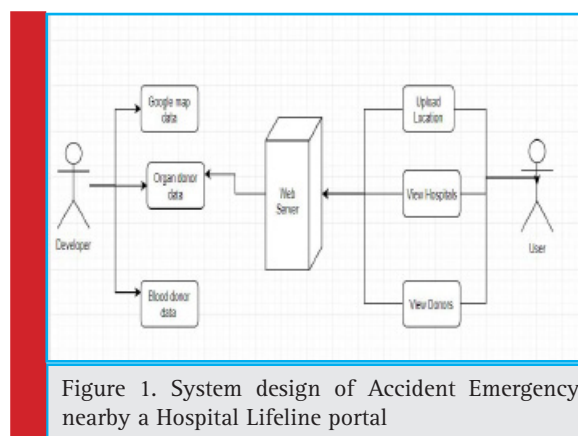
Figure 1. System design of Accident Emergency nearby a Hospital Lifeline portal

PROPOSED SYSTEM

The app consists of a basic UI for a login page that the user enters the credentials in. The app displays options such as the list of hospitals, an option to change location and the option to select donor. It also has options to view the reviews and add reviews on every hospital. The back end consists of the database of the hospitals and the donors that keeps updating in time via the cloud

Methodology:

1. The GPS is used to track the location of the user
2. The list of nearby hospitals are produced along with their distances in the app for the user to choose
3. The reviews of the hospitals based on data collected from social media is also displayed .The donor request displays the details of every available nearby victim.
4. The donors keep updating their information on the app for future reference

RESULTS AND DISCUSSIONS

The web App is expected to provide as an emergency aid that helps the user in viewing the nearby hospitals so he could choose which on to reach without wasting the time on selecting. This could result in saving lives that might be lost due to the lack of time during such situations. The organ and blood donation feature is also

expected to help the user contact the nearest donors to receive the required essentials which might otherwise take more time and effort if text messages or emails are used.

SCREEN IMAGES

Figure 2. Home page
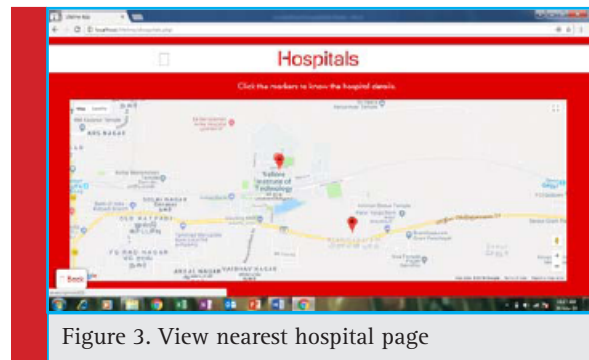
Figure 3. View nearest hospital page

CONCLUSION

Based on the features of the Web application, it is clear that it can be used to save numerous lives that might be lost due to insufficient facilities and time. The app is evi-
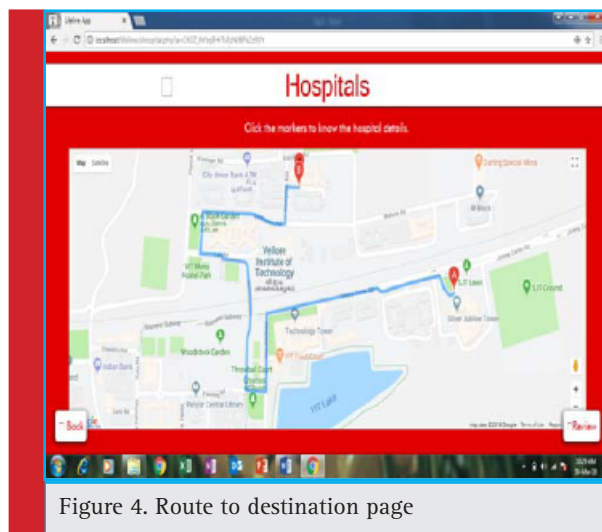
Figure 4. Route to destination page
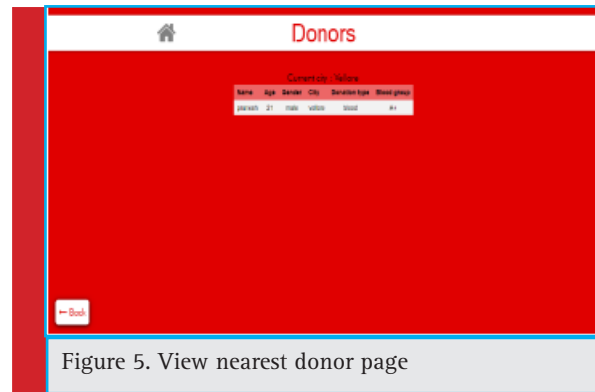
Figure 5. View nearest donor page

dently a replacement for a lot of methods such as calling, texting or e-mailing. Further developments such as automatic accident detection can be added in the future to make the app more efficient.

REFERENCES

Charani, E., Kyratsis, Y., Lawson, W., Wickens, H., Brannigan, E. T., Moore, L. S. P., & Holmes, A. H. (2018), An analysis of the development and implementation of a smartphone application for the delivery of antimicrobial prescribing policy: lessons learnt. Journal of Antimicrobial Chemotherapy, Vol. 68, No. 04, pp. 960-967.

Dayer, L., Heldenbrand, S., Anderson, P., Gubbins, P. O., & Martin, B. C. (2013), Smartphone medication adherence apps: potential benefits to patients and providers. Journal of the American Pharmacists Association, Vol. 53, No. 2, pp. 172-181.

Faiz, A. B., Imteaj, A., & Chowdhury, M. (2015), Smart vehicle accident detection and alarming system using a smartphone, in International Conference on Computer and Information Engineering (ICCIE), 1st International Conference on IEEE pp. 66-69.

Gopinath M.P, Tamilzharasi G.S, Aarthy S.L (2015), An Analysis and Performance Evaluation of NOSQL Databases for Efficient Data Management in E-Health Clouds, International Journal of Pure and Applied Mathematics, Vol.117, No. 21, pp. 177-197.

Johnston, M. J., King, D, Arora, S, Behar, N., Athanasiou, T., Sevdalis, N, & Darzi, A. (2015) ,Smartphones let surgeons know WhatsApp: an analysis of communication in emergency surgical teams, The American Journal of Surgery, Vol. 209, No. 1, pp. 45-51.

Kumar, K., King, E. A., Muzaale, A. D., Konel, J. M., Bramstedt, K. A., Massie, A. B., ... & Cameron, A. M. (2016), A smartphone app for increasing live organ donation, American journal of transplantation, Vol. 16, No. 12, pp. 3548-3553.

Mohanasundaram R., Periasamy P.S., (2017), Swarm, Based Optimal Data Storage Position Using Enhanced Bat Algorithm In Wireless Sensor Networks, International Journal of Applied Engineering Research, Vol. 10, No. 2, pp. 4311-4328.

Mohanasundaram R., Periasamy P.S., (2016), A Meta heuristic Algorithm for Optimal Data Storage Position in Wireless Sensor Networks, Pakistan Journal of Biotechnology, Vol. 13, pp. 463-468.

Mohanasundaram R., Periasamy P.S, (2015), Clustering Based Optimal Data Storage Strategy Using Hybrid Swarm Intelligence In WSN, Wireless Personal Communications, Vol. 85, No. 3, pp.1381-1397.

Mohanasundaram R., Periasamy P.S., Hybrid Swarm Intelligence Optimization Approach for Optimal Data Storage Position Identification in Wireless Sensor Networks, The Scientific World Journal (2015).

Mohansundaram R., Thenmozhi, Adwaith Sreekumar, (2017) "Reduction of Data Redundancy Using Data Aggregation in Wireless Sensor Networks", International Journal of Pure and Applied Mathematics. 117 (15).

Mostafa, A. M., Youssef, A. E., &Alshorbagy, G. (2014), A framework for a smart social blood donation system based on mobile cloud computing. arXiv preprint arXiv, Vol. 03, No. 02, pp. 1412-7276.

Ouhbi, S., Fernández-Alemán, J. L., Toval, A., Idri, A., &Pozo, J. R. (2015), Free blood donation mobile applications, Journal of medical systems, Vol. 39, No. 5, pp. 52-59.

West, D. (2012). How mobile devices are transforming healthcare. Issues in technology innovation, 18(1), 1-11.

Yuan, S., Chang, S., Uyeno, K., Almquist, G., & Wang, S. (2016). Blood donation mobile applications: are donors ready?.. Transfusion, 56(3), 614-621.

BBRC
Bioscience Biotechnology
Research Communications

Automatic Face and Facial Expression Recognition Video Using Modified LDTP

C. Ravichandran[1]*, C. Kalaiselvan[2] and T. Jayasankar[3]

[1]*Principal & Professor in the Department of ECE, Sri Nandhanam College of Engineering and Technology, Tirupattur, TamilNadu*
[2]*Professor, Department of ECE, NRI Institute of Technology, Guntur, Andra Pradesh*
[3]*Professor, Dept of ECE, University College of Engineering, BIT Campus, Tiruchirappalli*

ABSTRACT

The automatic face recognized video frame methodology employing a new Modified Local Directional Ternary Pattern (MLDTP) algorithmic program. MLDTP with efficiency encodes information of emotion-associated choices by pattern the directional information and ternary pattern therefore on need merit of the strength of corner shape at intervals the sting region whereas overcoming deficiency of corner-based ways in fine area. Here we have a tendency to project a rough mesh for stable codes (hugely associated with non-appearance) and a fine one for lively codes (hugely associated with appearance). This multi-stage concept permits us to try to an excellent grain explanation of facial expression, whereas nonetheless characterizing the coarse alternatives of the emotion.

KEY WORDS: FACE DESCRIPTOR, EDGE PATTERN, FACE ANALYSIS, MLDTP, FEATURE EXTRACTION, FEATURE VECTORS

INTRODUCTION

Face recognition of feeling has been a crucial section in personal face information automatically identifies MLDTP algorithm system. One amongst a new methods adopt for face recognition, identity mechanically are face expression, identity that detects and analyses human feeling from facial expression pictures. Facial emotion is often diagrammatic by looking modified within the data information face clearly. Regularly, intimating them specifically is that the keynote in facial feature faces is detecting recognition.

There are unit essential processes to explain facial pixel geometric-characteristic-based and look-feature-primarily based approach technique. The primary facial picture identifies by secret coding region of predominant

61

facial elements, like the mouth, eyebrow, nose, ear, etc. It will inform the facial picture element as with efficiency employing a few options, no change picture element and sequences. But, the facial image, reputation overall performance relies upon on the best position of the facial image parts, that place unit tough to detect below facial image alter on the face in line with facial image recognition. The arrival-characteristic-primarily based strategies will keep away from this drawback intrinsic. They constitute the facial picture by way of victimization picture filters that region unit carried out to the complete face or particular-face appearance (neighbourhood) to extract the looks changes of facial photographs.

Bhagylaxmi and Patil (2018) given a paper states that a unique nearby feature descriptor, neighbourhood directional quantity, sample, for face evaluation, i.e., face and expression reputation. LDN (Local Directional Number) encodes the movement facts of the face's textures, shape in a completely, compact way, producing a whole lot of discriminating code than contemporary approaches. We tend to divide the face into many sections, and extract the information of the LDN options from them. We have tended to concatenate these alternatives into a function vector, and that we utilize it as face information described. Ramirez Rivera and Consoli, (2017) worked on a "Spatio - temporal directional ranges transmutation graph for dynamic texture recognition," Spatio - temporal picture descriptors square measure advantage of attention in the image analysis community for better instance of effective textures. Throughout this paper, we have a tendency to introduce an effective -micro-texture description, i.e., spatio -temporal that describes each the spatial information data and flow of each nearby neighbourhood by using capturing the course of the natural motion within the temporal area.

Kotsia & Pitas, (2017) given the paper a growing popularity extra dependable under out of control lights, situations is considered one of the foremost vital challenges of sensible face recognition structures. specifically, we have a tendency to create 3 essential contributions,1) we generally tend to present a straightforward and least expensive pre-processing link that eliminates maximum of the results of fixing illumination, whereas nevertheless defensive the vital look information which might be required for popularity; 2) we have to inform local ternary patterns (LTP), a rationalization of the local binary pattern (LBP) local character description it is a number of discriminant and less touchy to noise in uniform areas.

Rachoori et al., (2018) laboured at the difficult FRGC-204 information set it fraction the error rate corresponding to earlier published methods, obtain a face information rate of 88.1% at 0.1% false accept a charge. Additional method so that our pre -processing tech-

nique outperforms many presents pre-processors for an expansion of feature units, information sets and lighting fixtures conditions. Zhang, Gao, Zhao, and Liu (2015) conferred a paper proposes a totally specific high-structure local sample description, local derivative pattern (LDP), for face popularity. The LDP might be a fashionable framework to put in writing in code directional pattern alternatives supported neighbourhood by-product alteration.

Special from LBP coding the hyperlink among the crucial point and its pals, the LDP arrangement, selection better-order neighborhood information with the aid of coding numerous unique abstraction tie-up enclose in a very given neighborhood location. Each grey-degree picture and Gabor function picture square degree need to price the relative achievement of LDP & LBP. The excessive-order LDP systematically plays a long way higher than LBP for each face recognition and face authentication beneath varied situations.

MATERIALS AND METHODS

A. Problem Statement

There are foremost techniques to give an explanation for facial pictures: geometric-function-based totally and look-feature-based approaches. The primary show the facial photo by coding region relations of major facial elements, like mouth eyes, nose, and so forth. The arrival-function-primarily based methods show the facial photo with the aid of exploiting image filters which can be implemented to the whole face (holistic) or particular-face regions (local) to select the seams versions of facial images. For each picture and video frames the motion image information considered.Database software package capable of checking out face objects or a specific face object is incredibly helpful. A well-known announcement of face recognition drawback might be developed as peruse: Given still or video picture of an image, determine or confirm one or plenty of persons within the image using a hold on information about faces.

B. Proposed System

A general approach for enhancing recognition accuracy is to combine effects from a set of algorithms and sensors victimization rating-degree fusion. Maximum of the offered fusion work rumoured inside the literature has focused on both combining regular data to cope with detector barriers or restricting the impact of a failing procedure as soon as the rating information place unit combined. Meta-reputation may be a publish popularity rating evaluation method that predicts as soon as

Figure 1. Structure of facial expression analysis Systems

is a smaller quantity essential because of its high quantity). Figure 2 indicates the approach of our projected methodology.

Experimental effects display that our method improves the overall performance of facial character recognition, especially in person-unbiased environments (N-character pass validation). For each face photo, we generally tend to 1st evaluated MLDTP codes by using the exploitation corner response and drop codes from smooth place. Then, for every group, we generally tend to feature factor bits to energetic styles and generated code vicinity unit accumulated right into a bar chart. Finally, every histogram is a unit connect right into a characteristic vector for countenance recognition. On this project advise a latest face descriptor for facial characteristic reputation.

Our technique encodes area, directional records of emotion-related options with performance by using, disposing of the meaningless ones from smooth areas inside the measure directional styles. Our projected methodology learns the lively aspect patterns from the feeling connected areas, with valuable accumulation in bar chart so they're taken advantage of in our projected descriptor with efficiency. Also propose a brand new committal to writing information that will increase spatial data with the energetic side sample, and consequently improves the category result.

On this fig. 3 shows that the planned MLDTP is an 8 bit format code allocated to every pixel of an input face picture. In expression recognition, the form of the countenance that modification according to expressions is a lot of the extra cogent than entire-face textures employed in face recognition, and additionally the bounds of the countenance have excessive part magnitudes. Consequently, we tend to undertake a grip operator to calculate facet responses expeditiously, and take 2 primary guidelines at each pixel to symbolize local

a popular method is succeeding or insufficient. That is terribly absolutely one-of-a-kind from any fusion technique; it really is centred on combining consistent facts expertise. If a secure method has failed compacted by the surroundings (Fig. 1), then a bio-metric (consisting of multiview face) it is supplying a variety of steady answers than any other (may be eye and ear) would not continuously suggest it should be notion-approximately with a whole lot of stress. For instance, if our evaluation supposes success for one procedure and failure for the other, we can proceed with the process this is no longer failing, regular system or no longer.

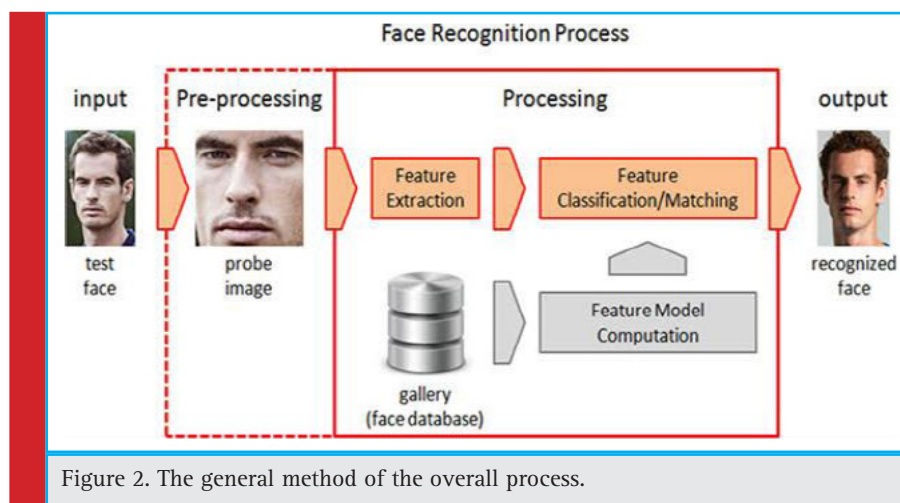The projected coding plan, select factor bits entirely to the active side patterns with vital accumulation to induce the end result of the victimization finer grid for the selected codes. It'll grow the overall performance by using applied the finer grid to the lively patterns (that want quite a few spatial facts and of that sampling noise

Figure 2. The general method of the overall process.

Figure 3. The general proposed block diagram

corner shapes. Our approach, in contrast to current techniques, distinguishes helpful directional styles and vacuous ones by victimisation side magnitude to avoid generating vain styles, and escape the noise inside the smooth areas.

C. Modified Local Directional Ternary Pattern (MLDTP)

Our estimated MLDTP is educational degree 8 bit pattern code assigned to each a part of instructional degree input face photograph. In face reputation, the form of the facial expression that alternate in step with expressions and face can be a ton of more effective than complete-face textures utilized in face popularity, and consequently the limits of the facial expression have excessive aspect magnitudes. Therefore, we have a tendency to adopt a position operator to

D. Block Diagram

Elevated in each and every side response with efficiency, and take 2 predominant course each picture element to represent locale edge shapes. Our approach, in comparison to present approaches, distinguishes beneficial directional patterns and insignificant ones by victimization edge value to keep away from producing vain patterns, and skip the noise within the swish areas.

E. Coding Method

The gradient route, rather than the gradient importance or intensity, is employed or advanced illustration of the pattern of the emotion-associated facial information features. The ternary sample encodes aspect-signal statistics, and differentiates between edge and glossy (nonaspect) areas.

Within the projected writing theme, we have a tendency to generate MLDTP code by area responses calculated with Robinson compasses mask, M0. M3, we tend to cypher the first and secondary instructions, and their comparable ternary patterns. The Robinson radius mask is bilaterally symmetrical and generate an equal significance reaction with absolutely one of a kind

Figure 4. The eight pattern used for computing the instruction on MLDTP
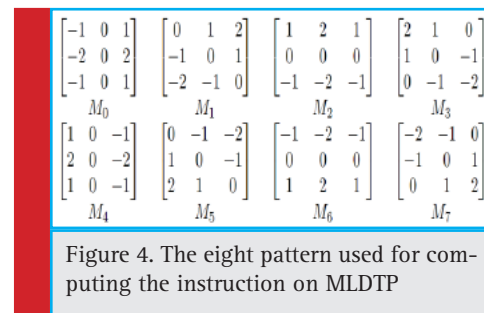
symptoms in contrary directions. For example, in Fig. 4, M0 and M4 masks have identical part reaction values, with the exception of the signal. Consequently, we will use entirely 4 masks from M0 to M3 to hunt down the foremost directions, which would possibly scale back evaluating them. Due to its symmetry, Robinson radius masks will correctly constitute the bilaterally symmetrical face expression. We tend to cypher that illustration by victimization 4 directional codes and therefore the sign data to create a ternary pattern.

F. Discriminability of MLDTP

On account that our method utilizes edge magnitudes and encodes ternary patterns to discard the useless ones, it's miles extra discriminating than existing aspect-primarily based strategies which handiest encode instructions. We calculate the brink reaction by means of Robinson radius mask with the original photograph, and select the number one and a secondary path to encode the form of facial functions. We display an instance of two 3×3 photo patches similar to the brink responses.

MLDTP will sight glossy areas by way of creating an awesome code while opportunity gradient-placed arrangement can't (like LDN), as they manufacture an equivalent code for really absolutely extraordinary texture. In an assessment of the first ternary sample employed in LTP, our ternary sample represents similarly information about the major instructions by way of sig-

nalling three conditions (i.e., positive or negative sturdy side response and weak area). Considering the fact that we have a tendency to use a symmetrical and consequently the ternary styles comprise the signature information (plus sign reply magnitude) to differentiate area and smooth regions, we generally tend to totally would like half the compass masks, for coding directions.

We assign a pair of bits to put in writing the first directional range, bits for the alternate one; and every correctional variety has two bits for each ternary sample, as on view in Fig. 4. The Robinson compasses a mask is carried out over the entire image manufacturing a collection of reaction magnitudes associated with the 4 guidelines.

$$R_i = M_i * I, \qquad 0 \leq i \leq 3, \qquad (1)$$

Where, I is that the authentic image, Mi is that the ith Robinson radius mask, and Ri is that the ith reaction image. Then, we tend to hunt for the jth most definite quantity D$_j$ of the 4 Robinson radius mask's replies, outlined by:

$$D_j(x,y) = \arg\max_i^j \{|R_i(x,y)| : 0 \leq i \leq 3\}, \qquad (2)$$

Where arg max^j_i is an associate degree operator that investigation the index i of the jth most value within the set. As expressed before, we are going to explore for the primary and 2nd position, i.e, j $\in$ {0,1, 2}. We tend to conjointly convert the comparable important route response right into a ternary sample. This operation encodes part response victimization three ranges (worse, same, and fantastic). Similarly, it includes the signal of the corner response. In different words, the ternary pattern suggests whether or no longer the direction is observed in a grip or in a completely glossy space. A new equation derive, we have a tendency to encode:

$$T_j(x,y) = \begin{cases} 2 & \text{if } R_{\hat{i}}(x,y) < -\sigma, \\ 1 & \text{if } R_{\hat{i}}(x,y) > \sigma, \\ 0 & \text{if } -\sigma \leq R_{\hat{i}}(x,y) \leq \sigma, \end{cases} \qquad (3)$$

Where in Tj is the ternary pattern of the significance of the jth motion at the placement (x, y), Ri(x, y) is the corner response of ith position at period (x, y), i = Dj (x, y) is the jth true path at the position (x, y), and σ is a threshold point. The threshold value divides the information solely in 3 modules, top, bottom and intermediate value. However, we are able to view the values as replace, better and lesser suggests that a robust, high quality or terrible aspect response, severely, while in between shows that a susceptible edge return. Let us discrimination, its ability to divide and preserve the directional data from the aspect's reaction and forget about the directional information of the smooth areas.

Placed on Tj , we will verify if Dj goes for use or no longer. Therefore, for every route Dj (x, y) the order is absolutely one of a kind. If the ternary method from the number one path is 0, meaning that the picture element (x, y) exists in a graceful area and thus an empty code (zero) is generated that later is being disregarded. Therefore, the code is made by way of connecting the binary sample of the 2 modules of guidelines and consequently the 2 ternary format styles.

$$\text{MLDTP}(x,y) = 2^6 D_1,(x,y) + 2^4 T_1(x,y) + 2^2 D_2(x,y) + 2T_2(x,y), \qquad (4)$$

In which MLDTP(x, y) is that the code for every element (x, y) within the face image, D1 and D2 are the directional variety of the first and secondary positions. From the 2 maximum masks responses of the neighbourhood of the component (x, y), and T1 and T2 are the primary and secondary ternary methods of the two guidelines, severally.

G. Face Recognition Description for MLDTP

This histogram situated picture is easy and robust to vicinity and code failure in a totally tiny location. But, it wishes decent sample codes & losses spatial data within every region, despite the fact that each region itself consists of factor records. Therefore, if we have a tendency to subdivide the face into additional areas, abstraction info will increase but samples, codes in each location lower thanks to the small size of the field. When you consider that the ones quick sample codes could purpose risky histograms (which vicinity unit called sampling errors), the bar chart based totally description incorporates a quandary to extend abstraction records.

Active Methods

The popular histogram (bar chart) summary, the spatial facts, data is extracted from a Two dimensional everyday grid positioned within the face. However, this concept is ineffective as it assigns same significance to any or all face expression abstraction data. Spatial data, information about emotion-related options are much additional crucial than others. Instead, we discover MLDTP codes showing oftentimes of emotion-related countenance, and assign the additional abstraction report to them. We tend to decide these MLDTP codes effective.

H. Description for MLDTP

Face description, we have a propensity to tend to get the code changed MLDTP of each space. Considering that spatial records of lively MLDTP codes are a number of important to face expression recognition, we tend to divide a neighbouring area into sub-areas of that each encompasses a unique label. We add additional spatial

data to energetic MLDTP codes via combining the factor label.

By using the use of sub areas and lively patterns, we are able to describe abstraction, data a number of with efficiency than current bar chart based totally descriptors. For instance, assume that MLDTP has fifty absolutely exclusive values throughout which ten values place unit active patterns and forty area unit conventional patterns. Let us to partition the face image into a pair of 2 × 3 areas with a couple of 3 × 2 a pair of sub areas. The quantity of active technique is a pair of 360 (2 × 3 × 3 × 2 × 10) and for traditional patterns is 300 (2 × 3 × 50), leading to 480 dimensions because of we tend to know not to consider sub areas as soon as we evaluated traditional patterns as defined. But, in existing bar graph based totally by and large report, the dimension is 1440 (2 × 3 × 3 × 2 × 40).

According to the procedure given above than as shown within the flow chart fig.5 "input frame human faces" of the hold on information is noted. Then feature direction vector of the every individual is calculated by getting it onto the set of face. When a take a look at a human image comes feature vector is calculated (Modified Local Directional Ternary Pattern) directional specifically within the same means. It calculated with the hold on information by comparing the space between two vectors and constituent image pixel intensity. The human image that has minimum distance with the take a look at image vector is our desired face detection result (Active Pattern Generation Check) from the input video.

I. Implementation of Face Recognition Technology

The implementation of face reputation technology includes the subsequent three ranges are information acquisition, input enter processing & Face image type and decision making

Data Acquisition

The input can be recorded video of the Actress Saoirse & Ronan or a still image. A sample of three sec duration include 30 frame in keeping with sec 640x360 pixels–103 frames video sequence. Multiple digital camera can be used to provide a 3-D representation of the face and to protect towards the usage of images to benefit unauthorized get right of entry to.

Input Processing

A pre-processing module locates the attention role and looks after the surrounding lights condition and colour variance. First, the presence of faces or face in a scene should be detected. As soon as the face frame is detected, it should be localized and normalization process may be
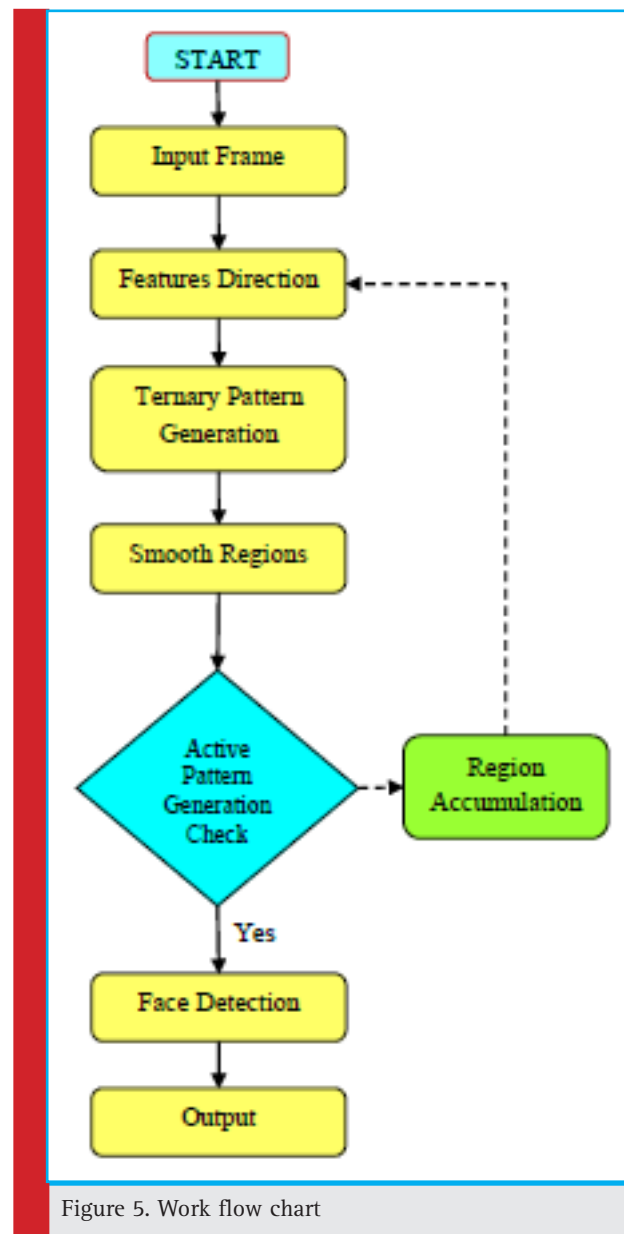
Figure 5. Work flow chart

required to carry the size of the live facial pattern in alignment.

A few facial reputation tactics use the whole face whilst others concentrate on facial components and or regions (including the lips, eyes etc.). The advantage of the face can exchange appreciably at some stage in speech and because of facial expressions. Fashions are educated unique to someone's speech articulates and the way that the individual speaks. Character identity is achieved by way of tracking mouth movements of the speak my face and by using estimating the likelihood of each version of getting generated the sequence of functions. The highest likelihood is chosen because the diagnosed man or woman as shown in fig.6.

Figure 6. Face recognition Processing steps

Figure 8. Actress Saoirse & Ronan Output Recognized Video Frame
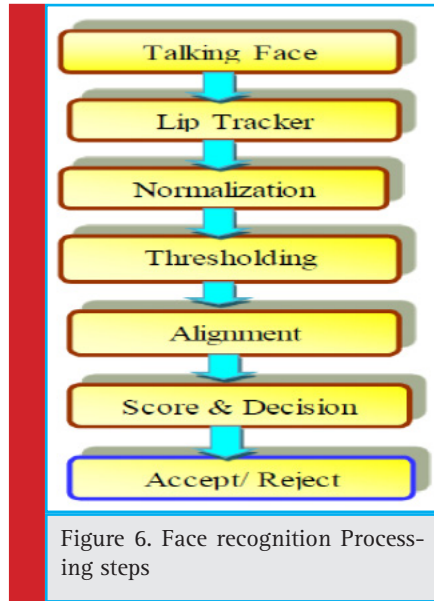
RESULTS AND DISCUSSION

a. Input Video Frame

In this work, we almost implemented (MAT LAB – software) the performance of the MLDTP algorithm technique as is shown Screenshot for Face recognition Actress Saoirse & Ronan enter Video frame beneath in fig. 7.

There are many procedures for face detection such as, color based totally, characteristic based (mouth, eyes, nostril) neural network. The technique studied and implemented in this work is the pores and skin color based method. The set of rules is pretty strong because the faces of many humans can be detected right now from an image which includes a group of humans. The version to locate pores and skin coloration used right here is the YCbCr model. The features of take a look at picture had been also extracted inside the same style and have been compared with the educated database.
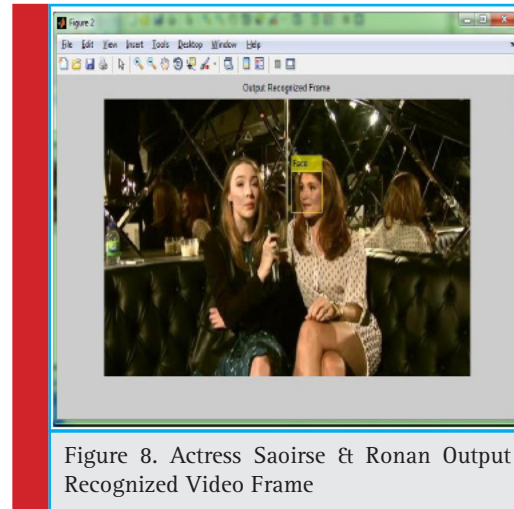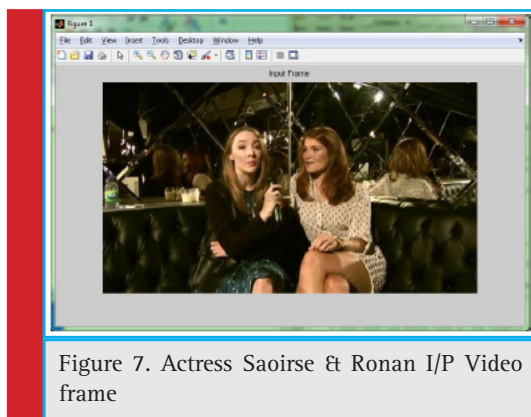
b. Output Video Frame – Image Matching

The eigen faces of a set of pixels are acquired and the suggest mean eigen face is taken as the reference for a face shape. All the pictures in the field are as examining with the eigen face and the correlation among them is determined out. Since the boxes may be of any size, the eigen face is saved in distinctive sizes. The face reputation became a success using a MLDTP algorithm on 96% of the result acquired. Actress Saoirse & Ronan Output recognized Video frame is 640x360 as shown in fig. 8.

c. Result Analysis

This software recognizes the facial expressions from either a photograph or video sequence. Along with JAFFE, CK+ facial feature datasets, photographs from Google seek are used to teach the system the usage of the above proposed version. Table.1 suggests Actress Saoirse & Ronan output video frame PSNR Calculation. The PSNR value obtained various present face recognitions strategies compare with the proposed method. The common PSNR value cost inside the MLDTP strategy development as compared to the previous algorithms. This suggests virtually that the proposed algorithm out plays. The analysis of PSNR consequences in Actress Saoirse & Ronan output Video frame picture is plotted in fig. 9.

Figure 7. Actress Saoirse & Ronan I/P Video frame

Table 1. Actress Saoirse & Ronan output video frame PSNR Calculation	
Face Recognitions Alogrithms	PSNR Value
SPTS	25.56
CAPP	26.78
CLM	27.31
EAI	28.45
LDTP	29.02
MLDTP	30.06
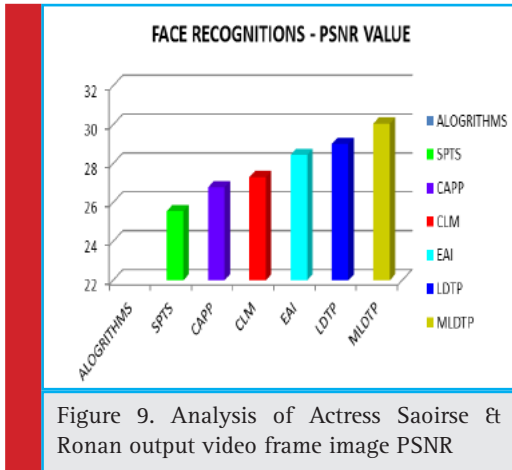
Figure 9. Analysis of Actress Saoirse & Ronan output video frame image PSNR

Table 2. Actress Saoirse & Ronan Execution Time Calculation

Face Recognitions Alogrithms	Time in Sec.
SPTS	88.56
CAPP	74.89
CLM	67.76
EAI	55.67
LDTP	45.78
MLDTP	44.34

Table 2 convey the mean execution time of the proposed system and the existing techniques for the Actress Saoirse & Ronan output video frame picture series shows the at every value of rate in bits in line with size. The execution time is better in the proposed gadget (MLDTP algorithms the use of Face recognition strategies). The output overall performance of the gadget throughout analysis of Execution time for analysis three sec video Actress Saoirse & Ronan 30 frames per sec – 640 x360 pixels– 103 frames as proved in Fig.10
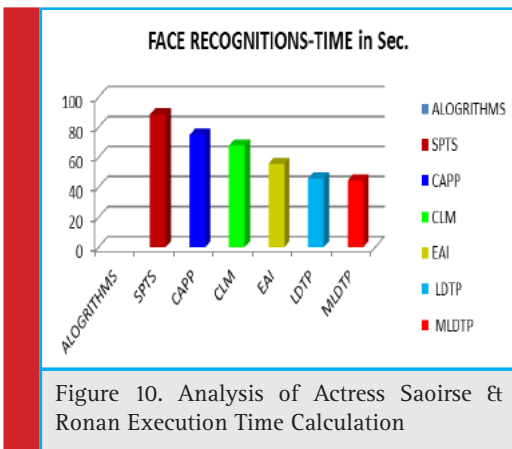
Figure 10. Analysis of Actress Saoirse & Ronan Execution Time Calculation

Table 3. Actress Saoirse & Ronan output video frame face recognitions

Face Recognitions Alogrithms	Accuracy
SPTS	50.4
CAPP	66.7
CLM	74.4
EAI	82.6
LDTP	94.2
MLDTP	95.6

Table 3 conveys the functions of check image were also extracted in the same style and were as compared with the trained database. The popularity becomes a hit on 96% of the event. The face recognition MLDTP algorithm becomes higher accuracy with as compared current gadgets. As a result, either manner it detected a face both True or false. The evaluation of Actress Saoirse & Ronan output video frame face recognitions of quantitative achievement costs is furnished as shown in fig. 11 underneath.
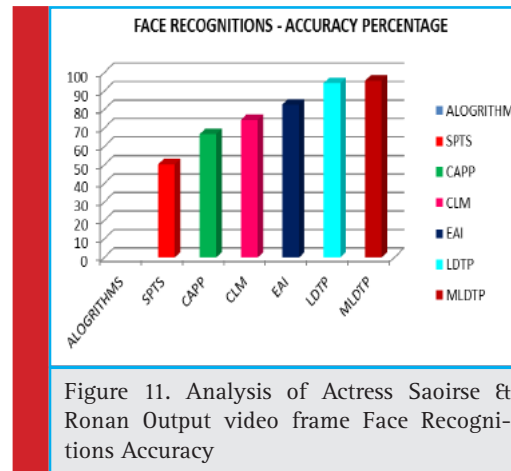
Figure 11. Analysis of Actress Saoirse & Ronan Output video frame Face Recognitions Accuracy

CONCLUSION

We planned a cutting-edge nearby by way of pattern, MLDTP that efficiently encodes format of face-linked functions (i.e. mouth, eyebrows, eyes and upper nostril) through using the directional statistics. For rugged encoding MLDTP carries ternary patterns that allow it to distinguish directional kinds of place or the smooth regions wherein arbitrary, insignificant, and noise sensitive patterns are generated. For strong a face name, we have a tendency to describe face image abstraction

effectively based mostly whole on MLDTP through the usage of energetic designs and sub regions that facilitate our description assign further spatial records to feeling associated face capabilities.

The face reputation and detection algorithms have been very well studied taking some of take a look at photos and ranging the situations and variables. All the work mentioned above concerned real time information. The MLDTP algorithm success information rates were given even as for face detection, the achievable price changed into exclusive for specific snapshots relying on the external factors. The general fulfilment, success rate was 96%. We calculated that our unique face describes the use of active pattern and sub regions offers higher normal achievement of facial feature recognition for advantageous situations.

The facial expression popularity gadget supplied on that research work contributes a strong face popularity version based on the calculating of observable attribute with the physical biometric feature. The physiological attribute of the human face with relevance to diverse statements together with the pleasure, disappointment, fear, anger, wonder and dislike are related to analytical systems which renewed as a base identical template for the popularity recognition.

Face detection, we have developed a set of rules that can discover human faces from an image. We have got taken pores and skin colour as a device for detection. This method works nicely for Indian faces that have a selected complexion various under certain variety. We have got taken actual life examples and simulated the algorithms in MATLAB efficiently.

REFERENCES

Bhagyalaxmi Tejinkar & Patil S.R (2018) Local Binary Pattern Based Facial Expression Recognition Using Support Vector Machine, the International Journal of Engineering and Science, vol. 7. no. 8, pp. 43-49.

Bourbakis N. & P. Kakumanu (2017) Skin-based face detection-extraction and recognition of facial expressions, in Applied Pattern Recognition. Springer, pp. 3–27.

Belhumeur, P. & Hespanha, J.(2017) Recognition using class specific linear projection, Pattern Analysis and Machine Intelligence, IEEE Transactions on, vol. 19, no. 7, pp. 711–720.

Consoli, D. (2017), Emotions that influence purchase decisions and their electronic processing, Annales Universitatis Apulensis: Series Oeconomica, vol. 11, no. 2, pp. 92-99.

Cheddad, A. Mohamad, D & Manaf, A (2016) Exploiting voronoi diagram properties in face segmentation and feature extraction, Pattern recognition, vol. 41, no. 12, pp. 3842– 3859.

Hamdi Dibeklioghu & Gevers.T (2018) Automatic Estimation of Taste Liking through Facial Expression Dynamics, IEEE Transactions on Affective Computing vol.1.no.1,pp.91-99.

Kotsia I. & Pitas, I (2017), Facial expression recognition in image sequences using geometric deformation features and support vector machines, IEEE Transaction. Image Process. vol. 16, no. 1, pp. 172–187.

Michael Revina I. & Sam Emmanuel W.R (2018) A Survey on Human Face Expression Recognition Techniques, Journal of King Saud University Computer and Information Sciences, vol. 1, no. 5. pp. 1-9.

Pantic M. & Bartlett, S (2016) Machine analysis of facial expressions. I-Tech Education and Publishing, Y.-L. Tian, T. Kanade, and J. F. Cohn, "Facial expression analysis," in Handbook of face recognition. Springer, pp. 247–275.

Rachoori, Keerthi, A. Obulesh, Pallam Ravi & Deepika.S (2018) A Literature Survey on Emotion Recognition System Using Facial Expressions, International Journal of Engineering Research in Computer Science and Engineering, vol. 5, no. 4, pp. 138-142.

Reinhard, E, & Myszkowski, K (2016) High Dynamic Range Imaging: Acquisition, Display and Image-Based Lighting. San Mateo, CA, USA: Morgan Kaufmann, pp. 65-74.

Sen, N.P. Kalantari, M. Yaesoubi, S. Darabi, D. B. Goldman, & E. Shechtman (2017) Robust patch-based HDR reconstruction of dynamic scenes," ACM Trans. Graph., vol. 31, no. 6, pp. 203-210.

Turk M. & Pentland, A (1991) Eigenfaces for recognition," Journal of cognitive neuroscience, vol. 3, no. 1, pp. 71–86.

Wang, Z.A.C. Bovik, H. R. Sheikh & Simoncelli, E (2017) Image quality assessment: From error visibility to structural similarity, IEEE Trans. Image Process., vol. 13, no. 4, pp. 600–612.

Ward, G (2017) Fast, robust image registration for compositing high dynamic range photographs from hand-held exposures, Journal. Graph. Tools, vol. 8, no. 2, pp. 17–30.

Weinberg P. & Gottwald, W (2016) Impulsive consumer buying as a result of emotions, Journal of Business research, vol. 10, no. 1, pp. 43–57.

Xie X. & Lam, K.M (2015) Facial expression recognition based on shape and texture, Pattern Recognition, vol. 42, no. 5, pp. 1003–1011.

Yang, JD. Zhang, A. & Frangi, F (2018) J.-y. Yang, Two-dimensional pca: a new approach to appearance-based face representation and recognition, Pattern Analysis and Machine Intelligence, IEEE Transactions on, vol. 26, no. 1, pp. 131–137.

BBRC
Bioscience Biotechnology
Research Communications

Chaotic Encryption for Fingerprint Authentication

N. Ganitha Aarthi[1]*, W.R. Salem Jeyaseelan[2] and K. Oviya[3]

[1,3]*Assistant Professor, Department of Information Technology, Karpagam College of Engineering (Autonomous), Coimbatore, India*
[2]*Associate Professor, Department of Information Technology, Karpagam College of Engineering (Autonomous), Coimbatore, India*

ABSTRACT

Biometrics based verification frameworks perceive people by considering their anatomical qualities or behavioral attributes and accordingly offers a few favorable circumstances over customary confirmation strategies, for example, passwords and personality records. Fingerprint acknowledgment is a one solid arrangement in biometrics based validation frameworks. In spite of their focal points the potential ruptures of security and privacy of the client's information are a still awaiting concern. Subsequently, biometric layout assurance to dodge fraud has turned into a noteworthy worry in the present security needs. In this paper, hearty unique fingerprint format assurance plot by using chaotic encryption which has outrageous sensibility on introductory conditions with perplexity and ergodicity with dissemination is exhibited. Conversely with different methodologies exhibited before, an entire security examination in both measurable dimension and execution level is displayed in order to legitimize the cryptographic quality of the proposed technique. Based on acquired outcomes, it very well may be surmised that the proposed installed verification framework is exceptionally secure, powerful and cheap, which are essential for any validation framework to increase public satisfaction for using in secure access control frameworks in real time.

KEY WORDS: FINGERPRINT, BIOMETRIC TEMPLATE, MURILLO-ESCOBAR, LOGISTIC MAP

INTRODUCTION

Initially Feature change and biometric cryptosystem are intended for biometric format security scheme. But these two frameworks do not fulfill the necessity of biometric format assurance algorithm and afterward the security given by these two frameworks is extremely poor. The attacker might obtain the details that are stored in database. To rectify this, DES algorithms were used in previous systems for security but the attackers hack

effortlessly due to low number bits utilized in framework (Uludag, 2004). Presently, 3DES (Triple Data Encryption Standard) and AES (Advanced Encryption Standard) are utilized as symmetric information encryption. AES has advantage as speed, low memory space, simple to execute, and it is situated in permutation and diffusion architecture. But downside is its speed, it does the procedure at low speed and quantity of keys it considered is likewise high. It does not seem to be a safe framework to keep the encrypted format to be more secure.

The RSA is an asymmetric algorithm with security advantage however it is moderate than some other symmetric method. DNA (Deoxyribonucleic corrosive) qualities have been proposed recently for encrypting text where the four DNA premises are described by binary data, DNA supplement activities are utilized for encrypting data, and DNA groupings are utilized as secret key (Bordoa & Tornea 2010).

Many other techniques have been used to overcome the limitations (Azzaz et al., 2010). In other hand, chaos has astounding properties like data mixing, ergodicity, sensitivity at initial stage, control parameters affectability, and so forth, all these are exceptionally helpful to structure cryptographic algorithms for content or pictures. In this paper, novel algorithm called symmetric content encryption is exhibited that are based on chaos. This utilizes the plain content attributes to oppose a picked/realized plain content assault with only one stage, dispersion round (change the position and value of symbol) and two strategic maps. Additionally, a 32 hexadecimal digits (128 bits) secret key is utilized. Also, the four properties of disorder framework are confirmed.

MATERIALS AND METHODS

Biometric System

Biometric identifiers are measurable and distinctive attributes used to describe and label individuals. Biometric identifiers are usually sorted as behavioral versus physiological attributes. The physiological attributes are identified with state of body, for example, palm veins, fingerprint, face acknowledgment, DNA, iris acknowledgment, Hand geometry, retina and fragrance. Behavioral qualities are recognized with the behavior pattern of an individual, for example, voice, rhythm. Due these properties, biometrics has been utilized to recognize or validate clients in a biometric framework, (Mihailescu, 2014).

Biometric validation frameworks can be increasingly helpful for the clients since there is no secret key to be overlooked or key to get lost and unique biometric quality (e.g., fingerprint) is made utilized to get to a few records without the issue of recollecting passwords. This method is ending up more prominent than conventional recognizable proof procedures, for example, ID card, password and individual ID number (PIN). Biometric ID steps as follows: initially the biometric test is taken from individual and related algorithm is implemented to ensure the information. Also, a similar method is rehashed for group of people and stored in database. These are the steps for enrollment process, (Admek, 2015).

Once the enrollment procedure is performed, he/she can recognize a person from a large collection of biometric records, i.e. one-to-many validation (a live biometric test or test introduced by an individual is contrasted with samples available in database, i.e. one to one process of matching) by showing his/her biometric sample in the framework (Maltoni, 2003) which will contrast the submitted sample with stored sample in database and further matching procedure is carried.

If the live biometric gets matched with any of the sample in database, the individual is perceived and the framework will acknowledge him/her. Or else the individual isn't recognized, i.e., he/she will be rejected. While managing the unwavering quality of a biometric framework, there will be some changes in the given sample than that of stored samples in the coordinating procedure by a vague procedure i.e., the biometric framework isn't 100% precision to produce the outcome.

There are two techniques to quantify the exactness of biometric framework, false acceptance rate (FAR) and false rejection rate (FRR). FRR is the number of rejections performed by biometric framework, i.e. at the point when the framework rejects a genuine client. FAR is the number of acceptance performed by biometric framework, i.e. at the point when the framework mismatches the biometric sample with stored sample this prompts to misidentification.

Attacks in Biometric System

In writing, vulnerabilities and assaults against biometric framework were exhibited in few models and from different perspectives, (Henniger, 2010). The biometric format will encounter 8 sorts of attacks, for example, attack on Feature extraction and sensor, in procedure of matching, in making decision, database template is appeared in below figure 1. Attack on database template is serious attack when compared with other attacks since it prompts wrong choice. Because of the security challenges, the Feature Transform and Biometric cryptosystem have been presented in biometric framework with a few favorable circumstances and furthermore it comprises of a few weaknesses however its primary target is to keep biometric layout to be revocable.

There are four fundamental requirements while planning algorithm for biometric template, they are Diver-

sity, revocability, Performance and Security. So as to conciliate all the security assaults and the necessities to meet the requirement of biometric, the biometric conspire is joined with chaotic encryption. The motivation to pick the chaotic encryption is due to its cryptographic property. The algorithm pursued to enhance the security is said to be Murillo Escobar's Algorithm.
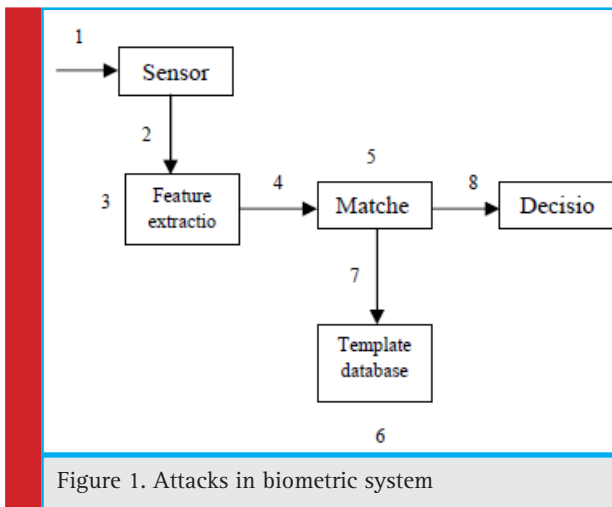
Figure 1. Attacks in biometric system

Authentication System

The registration procedure begins with the enrollment of new client. Initially plaintext value of fingerprint is taken from the reader module. The arbitrary secret key of 32 hexadecimal digits is picked and secret key is partitioned into four segments, with the assistance of this initial condition is calculated and also control param-

eter is discovered. After this, 2172 iterations have been made for logistic map 2. Then the other new logistic map is structured using logistic map that were designed before. Once the process of logistic map design is over, encryption process is exhibited. These steps are repeated for sample groups and stored in database. The sample is analyzed with database samples, if the match is found then the user is an authorized user else, the user is unauthorized user. The figure 2 demonstrates the stream of authentication framework associated with our proposed plan.

Encryption Algorithm

The proposed algorithm for encryption depends on Murillo Escobar's calculation. The plain content template P^e (0,255) of length 2072 bytes from the information is examined by fingerprint module (Escobar, 2015). The pseudorandom order created by chaotic framework is utilized to change over the plaintext into encrypted format. The one-dimensional map is known as simple non-linear confused framework that accomplishes the chaos path. The logistic map is portrayed as:

$$x_{j+1} = ax_j (1-x_j)$$

where, x_j belongs to (0, 1) and control parameter a belongs to (3.999, 4).

The 1D logistic map is utilized because of its few advantages, for example, basic structure, simple to execute in advanced frameworks because of its discrete nature, low usage of resources, low memory utilization and fast information generation. But the map also has a few disadvantages when it is utilized in cryptography, for example, ranges of chaos becomes discontinues,
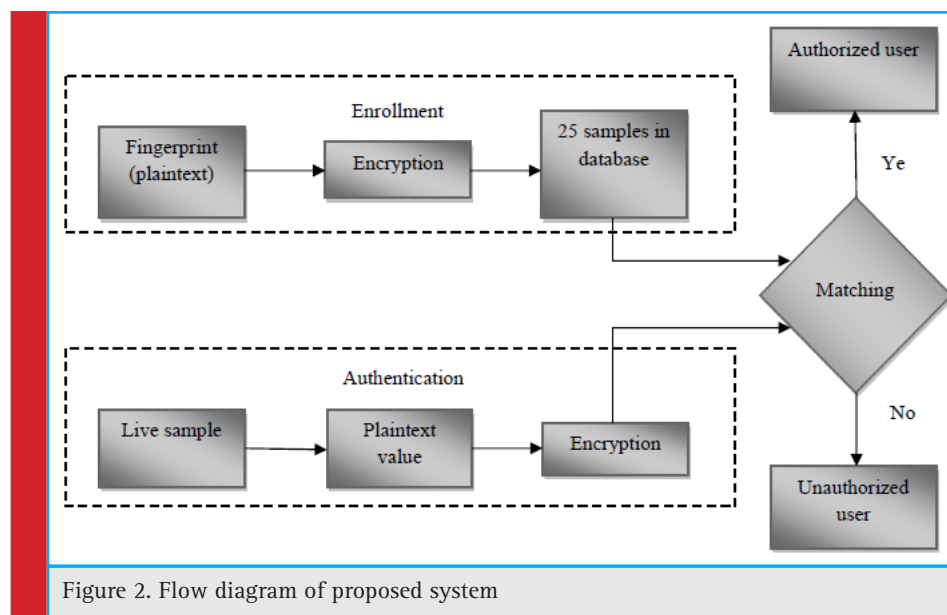
Figure 2. Flow diagram of proposed system

dispersion is not uniform, minimum space key in chaotic range. In countermeasure, the proposed encryption algorithm avoids the drawbacks while keeping up its favorable circumstances.

Secret key definition

Initially 32 Hexadecimal digits are accepted randomly as secret key (112233445566778899AABBCCDDEEFF). The secret key is split into four segments to produce initial condition and to generate control parameter of two logistic maps. Any key utilized here is considered to be strong and secure since it pursues the sequence of chaos. These considerations avoid drawbacks that were present in the chaotic range of logistic map. By utilizing the expression that is in table 1, initial condition is calculated and control parameter for logistic map is also obtained.

Calculation of Z

The value of Z is basic to undergo calculation since Confusion and Diffusion needs Z value and it additionally increments the affectability at bit level in plaintext and secret key. Every plain format components are summed with chaotic information to calculate Z. Logistic map 2 is repeated 2172 times utilizing a_2 and $x_{20}$. Sequence of chaotic is generated with decimal precision. Then every plain component are summed with xL2 as shown,

$$S = \{S + [P_i * x_{2173-i}^{L2}] + x_{2173-i}^{L2}\} \bmod 1$$

where i=1,2,3.....2072. P_i depicts the plaintext component I,

S is variable initialized with zero,

x^{L2} is chaotic sequence and does the modulo operation.

The next task is determined as,

$$V = \text{round } (S * 94) + 32 \text{ where } V \in [1,255]$$

Z value is computed by,

$$Z = V/256 \text{ where } V \in [0, 1]$$

Encryption process

The perplexity and dispersion process is actualized in encryption algorithm, where all plaintext components are permuted and changed based on chaotic information created by logistic map 1.

Chaotic sequence $x^{L1} = \{x_1^{L1}, x_2^{L1}, ..., x_r^{L1}\}$ is determined by utilizing Z, 5000 iterations, initial condition x10and control parameter from table given underneath. Decimal precision of 10^{-15} and $x^{L1} \in (0, 1)$. For confusion procedure, the succession is determined by using following equation,

$$Q_i = \text{round } (x_{2928+i}^{L1} * 2071) + 1$$

where i=1,2,3.....2072. Q $\in$ [1, 2072] is pseudorandom position vector for perplexity process. If every plaintext components are permuted, the encryption has a streamlined perplexity process.

For Diffusion process, sequence is determined by

$$F_i = \{(x_{2928+i}^{L1} * 1000) + Z\}$$

where i ranges from 1,2,3. . . 2072 and Fi $\in$ (0, 1) is vector with length of 2072 and with decimal precision of 10^{-15}. This procedure increments the security of the encryption procedure against powerful templates, (Alvarez & Li, 2006; Cokal & Solak, 2009). Fi is changed from [0, 1] to [0,255] as shown here,

$$Y_i = \text{round } (M * 255)$$

where Y_i is vector that is provided with length of 2072, that belongs to [0,255].

Encryption procedure depends on

Q- Pseudorandom confusion vector

Y- Pseudorandom diffusion vector.

Expression for encryption is depicted below,

$$E_i = (P (Q_i) + Y_i) \bmod 256$$

P - Plain template

E - Encoded template that belongs to [0,255]. This encrypted format is used for storing in database or for transmitting over an unreliable channel. To this E value, the value of Z must be included in 2073 position. i.e.,

$$E_{2073} = V$$

Decryption process

For decryption process, Z value is extricated initially from cryptogram using the expression below,

$$Z = E_{2073} / 256$$

After this, x^{L1} is created with a secret key that was utilized during encryption process. The same process that was used in encryption process for calculating Y_i and Q_i is used here.

$$D (Q_i) = (E_i - Y_i) \bmod 256$$

Where E - Cryptogram

D – Fingerprint template that is recovered 1_0.

Matching process

Initially 25 fingerprints are read from unique fingerprint scanner and after that the encryption and unscrambling process is finished utilizing mat lab software. Then the

Table 1. Initial condition used and control parameters declared		
Secret key	Initial condition	Control parameter
32 HEX digits	$H_1, H_2,......H_{32}$, where H € [0-9, A-F]	
Calculation	$A=((H_1, H_2,......H_8)_{10})/ (2^{32}+1)$ $B=((H_9, H_{10},......H_{16})_{10})/ (2^{32}+1)$	$C=((H_{17}, H_{18},......H_{24})_{10})/ (2^{32}+1)$ $D=((H_{25}, H_{26},......H_{32})_{10})/ (2^{32}+1)$
Logistic 1	$a_1=3.999+[((A+B+Z)mod1)*0.001]$	$x^1_0=(C+D+Z)mod1$
Logistic 2	$a_2=3.999+[((A+B)mod1)*0.001]$	$x^2_0=(C+D)mod1$
Range	$3.999 < a_{1,2} < 4$	$0 < x^1_0, x^2_0 <1$
Precision	10-15, where (a mod b)= (a-b)*(a/b), b≠0	

encrypted value of the chosen sample is stored in database. Each sample image is passed through fingerprint reader and encryption procedure is improved for that particular image. Finally the scrambled value of sample image is compared with already stored 25 samples that are in database. If matched, the client is validated and if not, the client is unauthorized to get into the framework. Flow chart for the matching process is shown in below figure 2.

RESULTS AND DISCUSSION

A protected encryption method must be exceptionally delicate for the given input, i.e. if there is a slight variation in plaintext then there should be huge variations in the encoded format. In the beneath figure 3, the 'red shading' shows the scrambled format for verified individual by setting a finger in a legitimate way and the 'green shading' demonstrates the equivalent validated individual by somewhat differing the their finger position. Through this investigation the sensitivity of encoded value for plain template is been proven.

Key sensitivity analysis

A cryptographic framework must be exceedingly sensitive at bit level variations in secret key, in both encryp-
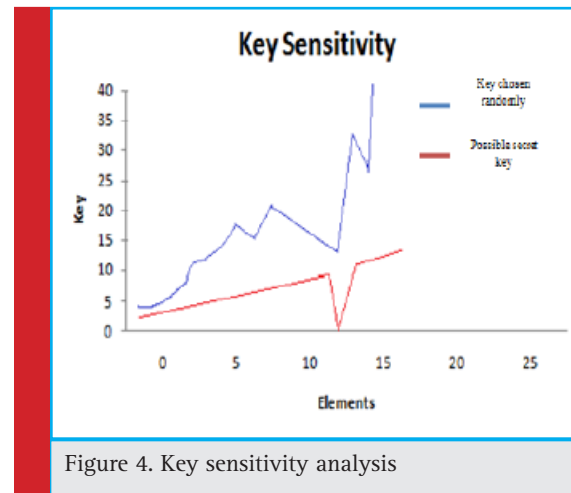
Figure 4. Key sensitivity analysis

tion and unscrambling process. The sensitivity analysis between the correct secret key and key which is given by the client is done so as to evaluate the cryptographic quality of algorithm. Through this the quality of the encoded value is demonstrated. If the client knows the secret key then he/she can get to the framework. The key sensitivity analysis is in figure 4, in which the red shading demonstrates the best possible secret key given by the client and blue shading shows key chosen randomly.
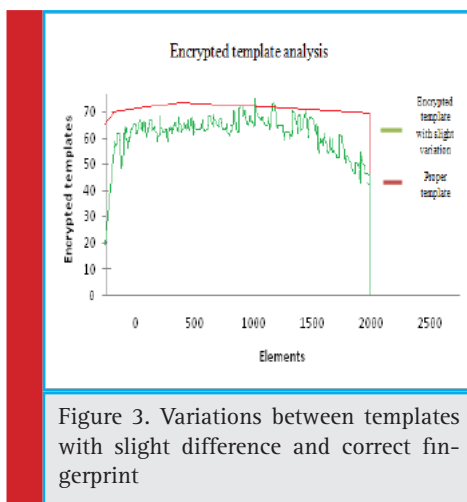
Figure 3. Variations between templates with slight difference and correct fingerprint
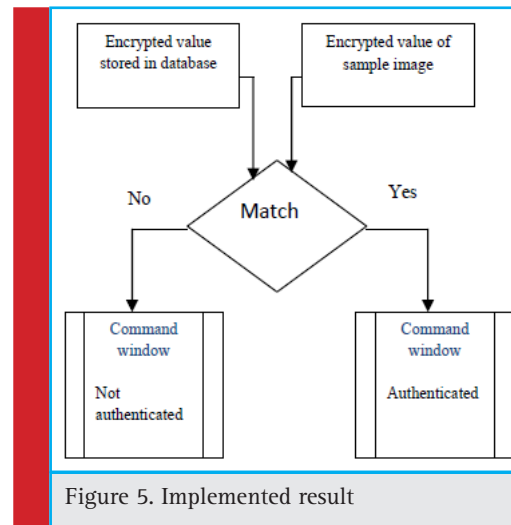
Figure 5. Implemented result

Implementation

The above algorithm of Murillo Escobar's is implemented for 25 unique fingerprints utilizing matlab. The encrypted results for 25 pictures are put away in a database as text file and it is recovered by utilizing matlab. Then sample picture is received from fingerprint reader module and preceded with encryption process. These encoded outcomes are compared with results put away in a database. If matched, the client is validated. If not, the client isn't validated. Figure 5 demonstrates the executed outcome which was implemented using matlab. Here, encrypted value from matching procedure obtained gives security to proposed system.

CONCLUSION

In this paper, powerful unique fingerprint protection algorithm that is with chaotic encryption technique is proposed for an exceedingly security for fingerprint authentication framework. The diffusion and confusion acquainted with chaotic encryption demonstrates the strength of algorithm. The examination of encrypted value and key sensitivity approves the algorithm to be profoundly proficient for applications in real time. Aside from examination, the algorithm is additionally actualized in biometric verification framework which demonstrates it flexibility for every single electronic device presented in current time.

REFERENCES

Abhyankar, Vijayat, Kumar, & Schuckers (2009), 'Encryption of biometric templates using one time biometric transform algorithm', CIIT International Journal of Biometric and Bio informatics, pp. 1-8.

Admek , M Mastek, M Pneuman, P (2015), 'Security of Biometric systems', Procedia Engineering, vol. 100, pp. 169-176.

Alvarez & Li (2006), 'Some basic cryptograpic requirements for chaotic based cryptosystem', International Journal of Bifurcation and Chaos, Vol. 16, Issue 8, pp. 2129-2151.

Azzaz, MS Tanougast, C Sadoudi, S A. Dandache and Monteiro, F (2010), 'Real Time Image Encryption Based Chaotic Synchronized Embedded Cryptosystems', 8th IEEE International NEW-CAS Conference, IEEE Circuits and Systems, pp. 20–23.

Bordoa, M., & Tornea, O (2010), 'DNA secret writing techniques, International Conference on communications', pp. 451-456.

Cokal, C & Solak, E (2009), 'Cryptanalysis of a chaos based image encryption algorithm', Vol. 373, Issue 15, pp.1357-1360.

Henniger, O Scheuermann D Kniess, T (2010), 'On security evaluation of fingerprint recognition systems', International biometric Performance testing conference.

Jain AK, Nandakumar. K & Nagar, A(2008), 'Biometric Template Security', EURASIP Journal on advances in signal processing, pp.17.

Kevenaar, T Korte, U Merkle, J Niesing, M Ihmor, H Busch, C & Zhou, X (2010), 'A reference for the privacy assessment of keyless biometric template authentication system', proceeding engineering, pp. 45-56.

Liu, R (2012), 'Chaos-based fingerprint images encryption using symmetric cryptography', International conference on fuzzy systems and knowledge discovery, pp. 2153–2156.

Maltoni, D Maio, D Jain, AK and Prabhakar, S (2003), 'Handbook of Fingerprint Recognition", Springer-Verlag'.

Mihailescu, MI (2014), 'New enrollment scheme for Biometric template using chaos based cryptography', Procedia Engineering, vol. 69, pp. 1459-1468.

Murillo-Escobar, MA Cruz-Hernández, C Abundiz-Pérez, F RM. López-Gutiérrez, RM (2015), 'A robust embedded biometric authentication system based on fingerprint and chaotic encryption', Vol. 42, pp. 8198 -8211.

Uludag, U Pankanti, S Prabhakar, S & Jain, AK, (2004), 'Biometric cryptosystems: issues and challenges', Proceedings of the IEEE, Vol. 92 Issue 6, pp. 948-960.

BBRC
Bioscience Biotechnology
Research Communications

Design of Public Transport Assistance System for Visually Impaired Persons

R. Madhumitha* and W.R. Salem Jeyaseelan

Associate Professor, Department of Information Technology, Karpagam College of Engineering, Coimbatore

ABSTRACT

Visual impairment is one of the problems some people face. These people depend on others for live their day-to-day life. The main challenge these visually impaired persons encounter are difficulty in navigating independently in urban area. Therefore, to support their day to day activities, many assistive systems will be necessary for them. This paper presents survey of the assistive systems that are available for visually impaired persons to overcome the necessity of depending on others. Also this paper presents a proposed the design of an assistive system/device for the visually challenged, elderly and other differently-abled people in using public transport means. The visually challenged, elderly and other differently-abled people encounter difficulties in navigating independently in urban area. Therefore, the use of a public transport assistive system seems to be necessary for them. This system helps to improve the blind persons in using the public transportation with the help of a mobile application along with electronic device and radio-frequency.

KEY WORDS: ASSISTIVE SYSTEMS, BLIND, RFID, VISUALLY IMPAIRED

INTRODUCTION

Visual Impairment (Bhavishya et al., 2018) is one of the main problems that certain human's face. These persons's often depend on others to navigate from one place to another place. Also these persons have problems in shopping, using public transport, etc. This paper discusses about the available assistive technologies for the visually impaired persons.

Public transportation is vital to visually challenged, elderly and other differently-abled people. There are many difficulties for these people in using public transport means like proper instruction cannot be provided where the bus stop is nor when the bus will arrive. Moreover, the visually challenged, elderly and other differently-abled people also do not have guidance about the bus timings at all times. Also, the bus drivers may not know that visually challenged are waiting at the bus

stop. Hence, a public transport assistive system/ device can be given as a solution for them to easily board into the public transport. The problem defined above has been faced by visually challenged, elderly, other differently-abled people (Kiran et al., 2015).

Generally these people have a problem to board into the public transport service. They find very difficult to find the bus and arrival timing of the respective bus. People with such difficulty create an insecure problem to travel from one place to another place in public transport. Bringing out such techno products for utilization in India shall improve their quality of life and confidence.

The authors (Mathankumar & Sugandhi 2013), propose a system which provides shopping assistance for the visually impaired persons in the super market. The products are identified by them using RFID technology along with audio instructions to the user to purchase the products. The authors (Shanthalakshmi et al. 2018), propose a system which uses raspberry pi to automate the navigation of visually impaired persons. This also uses ultrasonic sensors, camera, GPS sensor, weather sensor. Based on the inputs received by the sensors, the visually impaired persons are intimated using speech module with the help of the ear phones.

The authors (Gowtham et al. 2017), propose a system which has image sensors with colored lights are used to distinguish coloured lights for blind persons. The user has a mobile which is connected through LiFi with vibrator and ultrasonic sensor. This system helps such persons to navigate by getting alert through mobile as voice message.The authors (Bhavishya et al. 2018), propose a navigation system for blind persons with three ultrasonic sensors. These 3 sensors are kept in 3 directions. Apart by finding the obstacles, also directs the person to go in correct direction, i.e., checks the obstacles in all directions. This is done by calculating the distance and the alert whether to move or not is given by the buzzer.

The author (Snigdha et al. 2017), propose a system for bind and old aged persons to shop in a departmental store. The products in the shop has RFID tag on it and the user holding the RFID reader gets the information of the products when he passes by and this information is sent to his mobile as voice message. The authors (Patil et al. 2017), propose a system for blind persons for navigation using smart shoes. The smart shoes contain the sensors which find the obstacles and help the person to navigate through voice commands.

The authors (Jan Balata et al. 2016), proposed a system for navigation of visually impaired persons by collecting geographical data and helping them to navigate based on giving instructions according to landmark ie., gives the description of the landmark and the environment along with the steps to be done by them. The authors

(Lorenzo et al. 2014), propose an approach to guide the blind people by using audio sounds. The interaction of these people is like experiencing virtual reality. Learning is performed in virtual environment, simulating room with mental maps.

The authors, (Ramamurthy et al. 2018), propose an assistive approach for the assisting blind persons using shoes. The sensors are placed on the shoes which alerts them if they come across any obstacles. The authors (Raul et al. 2015), proposes a system for visually impaired persons to assist in living environments and in shopping. RFID is used to detect the interaction with the objects while doing shopping. This helps the visually impaired persons to independently shop in the supermarkets.

The authors (Anke et al. 2015), compares the interactivity for visually impaired persons to use the geographic maps for navigation. Even though the visually impaired persons perceive the map by haptic perception, still there are some limitations for them to use. Interactive maps helps to overcome these limitations, it as a multi-touch screen, overlay is raised with audio output, thereby making ease for the visually impaired persons.

The authors (Quoc et al. 2016), proposes a way finding system to assist the visually imapired persons. This system is deployed on a mobile robot. The outdoor motion sensors which finds the position change over time is used indoor environment. Additionally, the landmark scenes are optimized in the environment to assist the blind persons and this interface is deployed in smart phones of those persons.

The authors (Chucai et al. 2013) propose a camera based assistive device for the blind persons in reading the text labels. Mainly this device helps them to read the text from the hand held products. The camera used in this device helps these persons to read the text. The cluttered image view in the camera is limited by defining the region of interest of the objects. The captured image is recognized by learning the features of the image and optical character recognition is used to recognize the text in the hand held objects. The recognized text is given as voice output to the blind persons.

MATERIAL AND METHODS

This paper proposes a Design of Public Transport Assistance System for Visually Challenged, Elderly and other Differently-abled users. This paper proposes to design a mobile application with the preferred database. There is voice recognition software inbuilt with the mobile application along with the electronic device and radio frequency emitter. The mobile application system is used for getting the information of source and destination from the users through voice and provides bus arrival information to the users to board the bus. This

bus arrival information from the buses can be obtained by fitting the frequency emitter in the bus.

Voice based information is given to the user through mobile application when the corresponding bus with the corresponding frequency is nearer to the user. After the user boards into the bus and the destination is about to reach which is found by GPS, the destination information is provided to the user by voice message. This is the idea of visualization of a proposed device for visually challenged and elderly people to board into the bus.

RESULTS AND DISCUSSIONS

The artistic impression in Fig.1 provides visual clarity of the proposed system.

Figure 1. Proposed Artistic Design for the Public Transport Assistance System

CONCLUSION

Perception is one of the important channels in any human. If the human lack perceptual capabilities, it will be difficult for him. This visual impairment makes such persons difficult to live their day-to-day life. Hence this paper provides a survey of the assistive technologies available for the visually impaired persons to survive in day to day life. Along with this survey, this paper also proposes a design for the visually impaired persons to use the public transport. This design helps the visually impaired persons to help to board the bus without any help from others.

REFERENCES

Anke Brock., Philippe Truillet, Bernard Oriola, Delphine Picard, Christophe Jouffrais. (2015) Interactivity Improves Usability of Geographic Maps for Visually Impaired People. Human-Computer Interaction, Taylor Francis Vol 30, No 2: Pages 156-194. <http://www.tandfonline.com>. <10.1080/07370024.2014.924412>

Bhavishya P., E. Pavithra, V. Nivetha, R. Vidya Prakash. (2018) IoT based route assistance for visually challenged. International Research Journal of Engineering and Technology Vol 05, No 03: Pages 1991-1994.

Chucai Yi., YingLi Tian, Aries Arditi. (2013), Portable Camera-based Assistive Text and Product Label Reading from Hand-held Objects for Blind Persons. IEEE Transactions.

Gowtham S.U., Gokulamanikandan M, Pavithran P, Gopinath K. (2017) Interactive Voice & IOT Based Route Navigation System For Visually Impaired People Using Lifi. International Journal of Scientific Research in Computer Science Engineering and Information Technology Vol 2 No 2: Pages 323-327.

Jan Balata., Zdenek Mikovec Petr Bures, Eva Mulickova. (2016), Automatically Generated Landmark-enhanced Navigation Instructions for Blind Pedestrians, Proceedings of the Federated Conference on Computer Science and Information Systems ACSIS Vol. 8: Pages: 1605–1612.

Kiran B.N., Smitha B.C, Sushma K.N, Varsha R Gowda. (2015) Implementation of RFID for Blind Bus Boarding System. International Journal of Scientific Engineering and Applied Science Vol. 1 No 3: Pages 443-446.

Leena J. Patil., Neelam V. Kolhe, Prapti R. Patil, Sonali J. Mane. (2017) Smart Shoes for Blind People, International Journal of Engineering Science and Computing Vol 7 No 3: Pages 6059-6060.

Lorenzo Picinali., Amandine Afonso, Michel Denis, Brian F.G. Katz. (2014) Exploration of architectural spaces by blind people using auditory virtual reality for the construction of spatial knowledge. International Journal of Human-Computer Studies Vol 72: Pages 393-407.

Madhumitha Ramamurthy., Naveen V, Mithun K, Nivas R. (2018). IOT Based Assistive Technologies for Visually Impaired Persons. International Journal of Pure and Applied Mathematics Vol 119 No 12: Pages 647-652.

Mathankumar M. N., Sugandhi. (2013) A Low Cost Smart Shopping Facilitator for Visually Impaired, International Conference on Advances in Computing Communications and Informatics (ICACCI) Pages 1088-1092.

Quoc-Hung Nguyen., Hai Vu1, Thanh-Hai Tran1, Quang-Hoan Nguyen. (2016) Developing a way-finding system on mobile robot assisting visually impaired people in an indoor environment Multimedia Tools & Applications, Springer.

Raúl Parada., Joan Melià-Seguí, Marc Morenza-Cinos, Anna Carreras and Rafael Pous. (2015) Using RFID to Detect Interactions in Ambient Assisted Living Environments, IEEE Intelligent Systems Pages 16-22.

Shanthalakshmi.M., N.Raghav, Akanshya Dash, V.Vijaydeep, A.Divya Gayathri. (2018) A Smart Guidance System for the Visually Challenged using IOT. Journal of Network Communications and Emerging Technologies Vol 8, No 5: Pages 38-42.

Snigdha Kesh., S.Vasanti Venkateshwar, Ananthanagu U. (2017), Shopping By Blind People: Detection of Interactions in Ambient Assisted Living Environments using RFID. International Journal of Wireless Communications and Networking Technologies Vol 6, No 2: Pages. 7-11.

BBRC
Bioscience Biotechnology
Research Communications

A Multi Model Approach for Video Data Steganography with Avoiding Jellyfish Delay Variance Attack

W.R. Salem Jeyaseelan[1]*, K. Oviya[2] and N. Ganitha Aarthi[3]

[1]*Associate Professor, Department of Information Technology, Karpagam College of Engineering (Autonomous), Coimbatore, India*
[2,3]*Assistant Professor, Department of Information Technology, Karpagam College of Engineering (Autonomous), Coimbatore, India*

ABSTRACT

Steganography is an area of expertise of concealing the mystery information or data inside the carefully secured data. Video steganography is considered as a technique for concealing data and mystery communication of the most critical issues happened on the safe the information transmission in the electronic period. A noteworthy test in video encoding and transmission over remote systems is that the channel is mistake inclined while the compacted video information is exceptionally delicate to blunders. The principle motivation behind this paper is the effective information exchange of the information and to keep up the mystery of the information that will be transmitted. A novel procedure is proposed to disguise the presence of the message with the goal that it winds up precarious for aggressor to see it. It manages video steganography calculations to shroud video record inside other video utilizing Patch savvy Code Formation methods. This procedure gives strength; better video quality and verification capacity. We examine a convention consistent Jellyfish Delay Variance (JFDV) assault, propelled at system layer. In this assault, the noxious hub incorporates itself in course to goal and takes part in information sending.

INTRODUCTION

The point of video steganography is to accomplish the objective of mystery correspondence and send the mystery data to the objective side securely. Video is essentially a blend of various edges and every one of the edges establishing a video has a settled edge rate. These edges are indispensable building obstruct for the video and additionally for video encryption process. We can embed and send the content or video alongside the casing by utilizing different strategies. Advanced video speaks to the visual pictures moving as computerized information.

While, the simple video speaks to the moving pictures in simple video arrange. Video pressure is an innovation utilized for changing the video signals with the upkeep of the first quality under different circumstances, for example, stockpiling imperative, time defer limitation and power requirement. By abusing the information repetition between back-to-back edges and computational assets, the capacity necessity is reduced, (Rajalakshmi and Mahesh, 2017).

A Jelly Fish (JF) assailant pretend system control convention that there is a clog in the system that arrange isn't skilled to meet the preparing necessity of the client. Thus, arrange control conventions apply blockage control components prompting disturbance of the system correspondence. One such assault is Re-requesting Jelly-Fish assault is talked about in this paper and our principle objective is to discover an answer for follow and lighten a JF re-arrange assault. Despite the fact that individuals have concealed privileged insights on display currently called steganography all through the ages, the ongoing development in computational power and innovation has impelled it to the cutting edge of the present security systems. Steganography is frequently mistaken for cryptology in light of the fact that the both are com-

parable in the way that they both are utilized to secure critical and discharge data. The distinction between the two is that Steganography includes concealing data so it creates the impression that no data is covered up by any means. On the off chance that individual perspectives the protest that the data is covered up within the person will have no clue that there is any shrouded data, consequently the individual won't endeavor to unscramble the information (Patel and Patel, 2014).

For source coding distortion, a significant body of research has been conducted to study the Rate-Contortion (R-D) conduct of the coding framework, from the early Shannon source coding hypothesis (Jenifer et al., 2018) to ongoing R-D examination of present day video coding frameworks (Sharma et al., 2014).

In light of R-D models, rate portion and quality control calculations have been created to control the utilization of bit spending plan and to improve the framework execution under piece rate requirements. Contrasted with source coding contortion examination, the transmission bending investigation is extensively all the more difficult in light of the fact that it needs to manage irregular transmission mistakes and blunder proliferation along the movement expectation way.

In normal video scenes, scene objects have complex movement designs, and thusly, the mistake spread regularly shows an exceptionally muddled conduct. Notwithstanding the irregularity of transmission mistakes and convoluted blunder spread examples, the transmission contortion examination additionally needs to display the translating and mistake camouflage practices at the recipient. Understanding the trouble in scientific transmission contortion demonstrating, most related research take a shot at transmission bending investigation has been centered on heuristic examinations. A run of the mill approach is to utilize an operational transmission
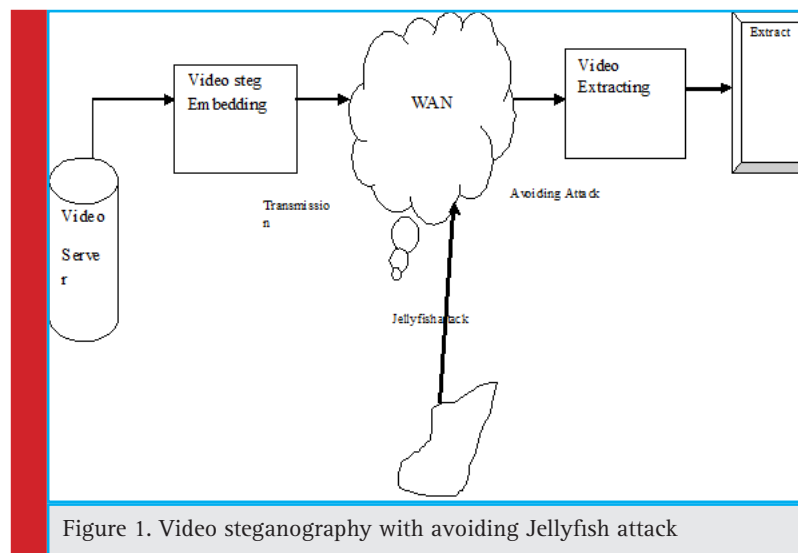

Figure 1. Video steganography with avoiding Jellyfish attack

contortion display, which is gotten from disconnected estimations of the transmission twisting over an extensive arrangement of preparing video groupings. Plainly, this operational methodology isn't effective in light of the fact that the blunder proliferation conduct fluctuates significantly starting with one video grouping then onto the next. A measurable reproduction approach is proposed in, where the unraveling and mistake covering conduct of the beneficiary is recreated at the encoder side to assess the transmission contortion in a factual normal sense. Such estimation conspire includes high computational multifaceted nature and execution cost. Furthermore, it doesn't prompt an expository model for transmission bending, which is anyway required for execution enhancement and asset allocation (He and Xiong, 2006).

Threat from noxious hub: MANET can be assaulted by a vindictive or narrow minded hub. Such a Node may upset the whole system (Patel and Patel 2014). **Secure Data Transmission**: In any system security and unwavering quality of information is basic. Subsequently, securities measures must be pursued to keep the information secure and avoid arrange vulnerabilities, for example, dynamic and inactive assaults in a system (Eltahir et al., 2009).

Traffic Management and Fault resistance: It must work securely and pursue predefined air-traffic pathways. The way should be hearty and qualify least blame tolerance (Nyo et al., 2018).

Aggressor Node Skip Key Packets In the hubs surge the system with Join, the recipient acknowledges one of a kind identifier of the parcel. Aggressor avoids key strides of this directing method and acquires access to the sending bunch (Thomas, 2015).

MATERIAL AND METHODS

Video based steganography should be possible in two different ways: either casing to outline information putting away or changing over casing into recurrence area and afterward store the outcome.

First way is something like spatial space and the second way resembles recurrence area. Whichever technique is used for steganography, the video steganography can be likewise characterized into two kinds: lossless and lossy steganography. In lossless steganography the shrouded data and unique video document both can be recovered with no blunder or change, while in lossy steganography the concealed data is recovered effectively while the first video will have some errors.

The lossless steganography requires putting away concealed data in detail area and will requires some an opportunity to run the calculation so as to locate the explicit area where shrouded data can be get put away.
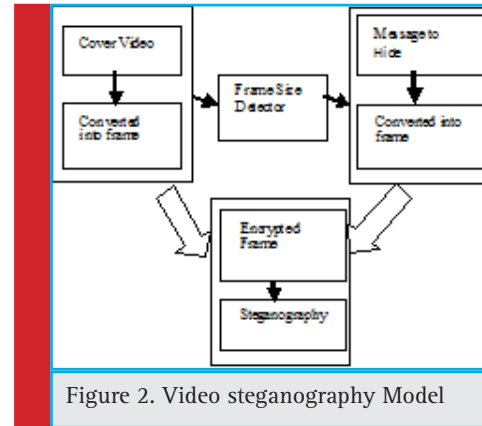
Figure 2. Video steganography Model
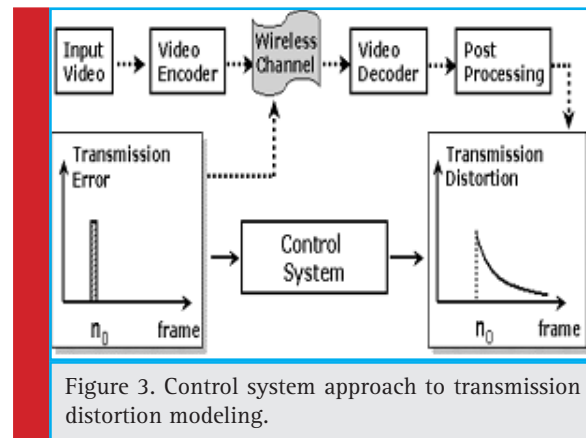
Figure 3. Control system approach to transmission distortion modeling.

Accordingly, progressively application, the lossless calculation is getting to be harder to execute, and that relies upon the framework particulars. The lossy steganography requires putting away information at some LSB area or at explicit pixel areas. This is anything but difficult to actualize and it very well may be apply continuously application with any ordinary framework particulars.

C.1 Overview of the Proposed Control System Approach

In this work, we propose to investigate another way to deal with transmission contortion displaying utilizing the essential ideas in control frameworks. This new methodology will empower us to consider the effect of transmission blunders on the conclusion to-end video correspondence all in all, rather than a subset of individual encoding and unraveling modules as in the current transmission contortion models. Our goal is to consider the conduct of transmission mistakes at last to-end remote video correspondence framework and build up a scientific model for transmission mutilation. Utilizing this model, the sender ought to have the capacity to anticipate the average1 transmission bending in the got video. In this segment, we present our fundamental thought and approach for transmission twisting demon-

Figure 4. Proposed Framework for Decoding Video steganography
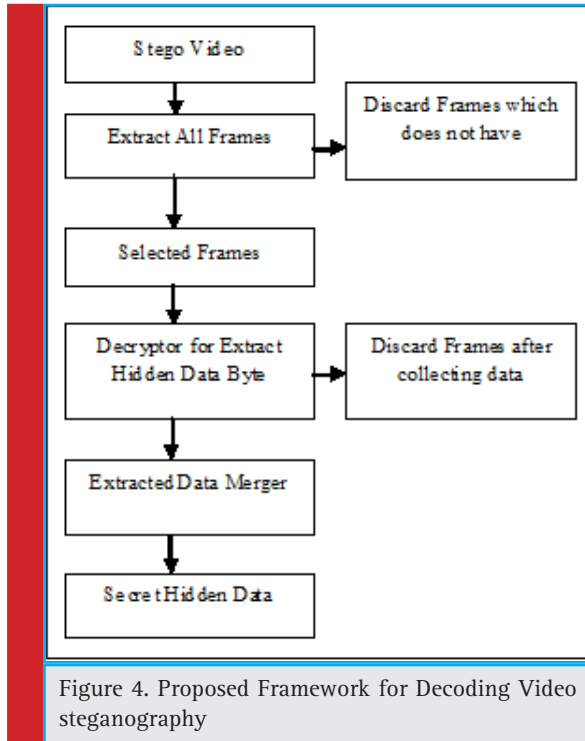
strating, we will examine how to execute the proposed methodology and assess its execution.

C.2 Simulation of JFDV Attack

To simulate JFDV attack, Convergence time for all the protocols is taken as 30sec. During route discovery, some nodes among en route nodes are selected at random to be the Jellyfish (JF) nodes. This fraction of malicious nodes is chosen in such a way that JF nodes have their maximum participation in the route to destination. Generalized algorithm to simulate JFDV attack is given below.

C.2.1 Generalized Algorithm

for all Data packets p do
  if $Receiving_{node} == JF_{node}$ then
    enqueue p
    $Time_{simulation} = Timesimulation + delay$ period
    dequeue p
    forward p to it's upstream node
  else
    forward p to it's upstream node
  end if
end for

RESULTS AND DISCUSSION

Steganography is an astounding method for talking clandestinely if there are ensures on the respectability of the channel of correspondence. It isn't vital for the two gatherings to consent to an explicit concealing organization. In the event that the video is seen by ordinary individual, it is discovered that there is only the typical video, however just the realized people can discover the unscrambled message from the video. The Different encryption organization can be concurred by the two people so that nobody can discover the data from the video. Every procedure can be executed effectively, yet in the event that somebody endeavors to discover the traps in the wake of realizing that somebody utilize the stego-video record, at that point there are great odds of discovering the shrouded data. So as to keep away from this, the some half-breed framework is utilized, so that despite the fact that somebody discovers the one method, it is utilized just on few casings and different edges contains distinctive sort of steganography and thus add up to discharge message isn't conveyed.

In Here, another methodology for video steganography was given. The premise of this technique considers the computerized video record as independent casings and changing the yield picture showed on every video outline by shrouded information that does not outwardly change the picture. With this method, one can apply shrouded data with more space superior to other steganography media. We apply the 3-3-2 approach. The outcomes were fruitful on the separated arrangement of the video outlines as appeared.

The outcome was great and the extent of information was generous, around 33.3 % from the measure of picture, envision. At the end of the day, in about five pictures, 500 pages of information could be put away without resizing. So also, one moment in certain video types contains roughly 27 outlines, which thus makes bunches of space for concealing information. For future work so as to shroud data in the yield outline one can utilize different strategies for picture steganography, which are suitable for this venture.

D.1 Performance Metrics

We use packet delivery ratio (i.e. PDR) to analyze the performance of routing protocol under presence of attack. PDR is ratio of number of packets successfully delivered to a destination to the number of packets that have been sent by the sender. It represents the maximum throughput that the network can achieve. A high PDR is desired in a network. If Ns is number of packets sent by a sender and Nd is the number of packets received by a destination then PDR is given as:

$$PDR = Ns/Nd$$

CONCLUSION

Video implanting dependent on pressure procedures study the current strategies don't productively reestab-

Table 1. Simulation Parameters

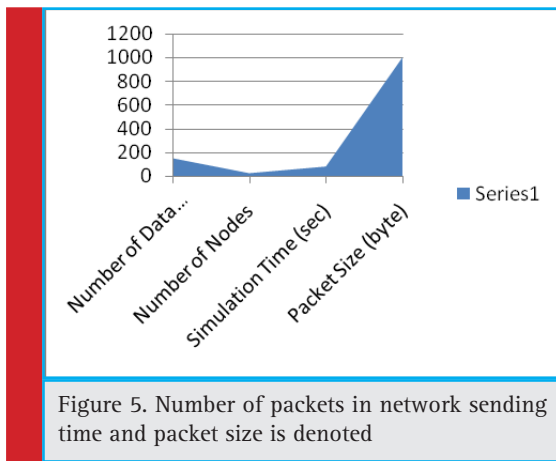| Parameters	Value
Transmission Area	2000X2000
Number of Data packets	150
Number of Nodes	24
Simulation Time	80 sec
Mobility Model	Random Way Point
Packet Size	1000 byte
transmission Level	1.0 sec
PhyMode	Rate 1 Mbps

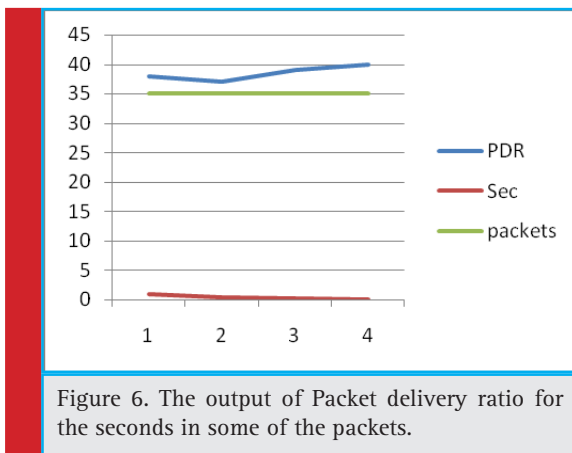Figure 5. Number of packets in network sending time and packet size is denoted

Figure 6. The output of Packet delivery ratio for the seconds in some of the packets.

lish the pressure outlines; the pixel data is additionally lost amid the changes. Further, these current procedures increment the time and computational intricacy and furthermore don't give a security of the video. Therefore, to address every one of these issues on this paper, in view of our proposed work has presented a novel strategy utilizing Patch astute Code Formation is anticipated for secure video change. The recommended system misuses a fix savvy pixel gathering method for playing out the pressure. Amid the pressure procedure, the recordings are part into numerous patches. The intermittent area of the pixels is recognized for each fix. The evaluated pixel areas are put before the pixel esteem for the whole video. In the wake of compacting the edges, the LSB calculation plays out the inserting procedure. By utilizing the video pressure for the most part to diminish the quantity of bits and furthermore installing procedure for keep up the security procedure. This Patch shrewd code development method is utilized for implanting based pressure can accomplish more precision and diminish time intricacy and give security.

We will incorporate progressively far-reaching investigation of organize elements, dependence frameworks and parameters that could help in precise forecast of a solid hub. We might want to enhance our calculation to likewise consider data transfer capacity and vitality limitations of the general system what's more, unique way traversal and propose a formal scientific model to investigate and approve our examination.

REFERENCES

Mary Jenifer, J., Raja Ratna, S., Shajilin Loret, J. B., & Merlin Gethsy, D. (2018), 'A Survey on Different Video Steganography Techniques', International Conference on Trends in Electronics and Informatics (ICOEI).

Eltahir, M. E., Kiah, L. M., Zaidan, B. B., & Zaidan, A. A. (2009), 'High Rate Video Streaming Steganography', International Conference on Information Management and Engineering. doi:10.1109/icime.2009.13

Nyo, H. L., Hlaing, A. S., & Maw, T. W. (2018). Secure Data Transmission Using Steganography and Twisted Exchange Algorithm. 2018 IEEE International Conference on Information Communication and Signal Processing (ICICSP).doi:10.1109/icicsp.2018.8549798

He, Z., & Xiong, H. (2006), 'Transmission Distortion Analysis for Real-Time Video Encoding and Streaming Over Wireless Networks', IEEE Transactions on Circuits and Systems for Video Technology, Vol.16, Issue 9, pp.1051–1062.

Patel, R., & Patel, M. (2014), 'Steganography over video file by hiding video in another video file, random byte hiding and LSB technique', IEEE International Conference on Computational Intelligence and Computing Research.

Rajalakshmi, K., & Mahesh, K. (2017), 'Video steganography based on embedding the video using PCF technique', International Conference on Information Communication and Embedded Systems (ICICES).

Sharma, A., Kaur, R., & Karmakar, P. (2014), 'JFDV Attack: Influence on Workability of Mobile Ad-Hoc Networks', Sixth International Conference on Computational Intelligence, Communication Systems and Networks. doi:10.1109/cicsyn.2014.44

Thomas, A., Sharma, V. K., & Singhal, G. (2015), 'Secure Link Establishment Method to Prevent Jelly Fish Attack in MANET', International Conference on Computational Intelligence and Communication Networks (CICN). doi:10.1109/cicn.2015.224

BBRC
Bioscience Biotechnology
Research Communications

A New Way to Protect Video Steganography Method Based on Discrete Wavelet Transform and Multiple Object Tracking

K. Oviya[1]*, N. Ganitha Aarthi[2] and W.R. Salem Jeyaseelan[3]

[1]Associate Professor, Department of Information Technology, Karpagam College of Engineering (Autonomous), Coimbatore, India
[2,3]Assistant Professor, Department of Information Technology, Karpagam College of Engineering (Autonomous), Coimbatore, India

ABSTRACT

Protection has dependably a developing effect on the wounding edge applications and the development in term of innovation. The interest in the most noteworthy security must be ensured in the field of specialized, business and legitimate directions at whatever point touchy data is put away, handled, or conveyed in any shape. Steganography was presented because of such extraordinary research works, however in spite of such a huge amount of inquires about still we have issues of limiting the blunder and acquiring better PSNR values. Video Steganography is a strategy or innovation which is utilized to exchange mystery data or message by changing a sound flag into an intangible way. It's the capacity of whipping secret message or sound information in a host or another message, Video Steganography alludes to concealing a private information or message, it very well may be an instant message or a picture inside a bigger or another in a style that by just looking or seeing at it an obscure individual can't see the occurrence of cloaked message. Our work introduces a hybrid algorithm which decreases the mistake in video Steganography and gives better estimations of PSNR and MSE.

**KEY WORDS:** VIDEO STEGANOGRAPHY, PSNR, MSE, DWT, MOT

85

INTRODUCTION

Steganography is a craftsmanship to shroud the data which is to be transmitted subtly inside an advanced medium without uncovering its reality in the medium. Regardless of the way that the Internet is used as a medium to get to wanted data, it has likewise opened another entryway for assailants to acquire valuable data of different clients with little exertion (Mustafa et al., 2017).

Steganography has worked in a correlative ability to offer an assurance system that conceals correspondence between an approved transmitter and its beneficiary. Steganography is characterized as the specialty of hiding mystery data in explicit transporter information, setting up clandestine correspondence channels between authority parties. Today a testing issue of information correspondence, information security contacts numerous zones, for example, secure correspondence channel, confided in outsider to keep up the database and solid information encryption system. It fundamentally goes for safeguarding the securing, mystery and integrity of information from unapproved clients or programmers. The more quick advancement in data innovation, the more secure transmission of private information turns into a lot of consideration. For pernicious reason, an unapproved client could get to the data. Along these lines, so as to improve the information security, numerous systems, for example, computerized watermarking; steganography and cryptography were developed (Nyo et al., 2018).

Spatial space systems are extremely straightforward and simple to actualize. More measure of data can be covered up absent much trouble. LSB (the Least Significant Bit) changeover is the most usually utilized technique for concealing information in the spatial area. In this technique, couples of the least serious bits of the pixels of the cover picture are supplanted by the bits of mystery information.

1. Cryptography – It is the specialty of concealing data so that it tends to be anticipated that the transmission incorporates a mystery message. Though, in
2. Steganography- it is hard to differentiate the proximity of mystery data (Singh and Yadav, 2017).

Figure 1. Basic Steganography System
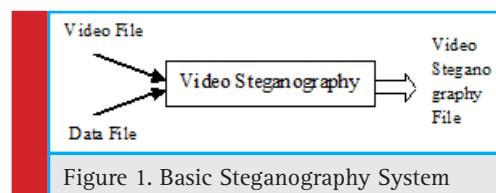
The steganography structure includes the cover record (picture, sound, video, etc) and the secret message that is concealed inside the cover report by applying steganography the riddle message is concealed and stego archive is made which is same as cover picture and go undetected or unaltered (Wajgade and Kumar, 2013) .

1.1 Video Steganography

Video steganography is utilized for two fundamental reasons: 1. A video includes number of casings and each casing can convey data. Hence, to move messages in mass, video steganography is utilized. 2. Video steganography is increasingly secure when contrasted with Image Steganography (Teotia and Srivastava, 2018). Video steganography has different points of interest and impediments over different systems. On one hand, it has an edge over picture steganography in that change of a video archive is essentially harder to perceive by people in visual structure, as casings are appeared on screen for a to a great degree brief time allotment. Moreover, video outlines are not fresh, strongly centered pictures. In this way, variety in pixel shading started by steganography will mix into the casing. Likewise, Video (particularly top-notch video) holder records are essentially bigger than some other sound or pictures documents, hence lessening the issue of stenographic limit.

Specialists have actualized different methodologies for data and information security to accomplish mystery correspondence. Steganography is a technique for covering the riddle messages into the carrier medium, for instance, picture, sound, video, etc. steganography framework is commonly characterized into three principle types to be specific, procedure misusing picture arrange, technique inserting in recurrence space and technique in spatial domain (Narayanan et al 2012).

Stego is a Greek word which implies covered up. The antiquated individuals utilized different strategies

Figure 2. Video Steganography Model
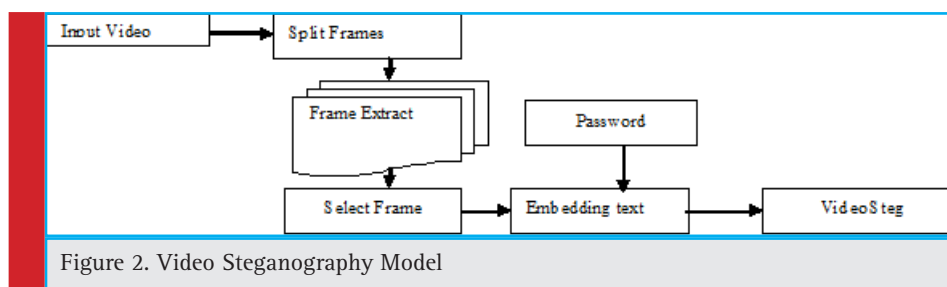
to send the mystery messages amid the war time. The assessment of steganography method is finished with three parameters, for example, limit, vigor and security. The framework ought to be equipped for concealing the data into cover media, it ought to be powerful to the progressions and it ought to be anchored enough from meddlers or aggressors that will in general distinguish or change the substance of the mystery data. The analysts have executed different methodologies relying upon the cover medium or the strategies utilized such as (Swathi and Jilani, 2012).

a) Cover Generation Method.
b) Distortion Technique.
c) Statistical Method.
d) Spread Spectrum Technique.
e) Transform Domain Technique.
f) Substitution System.

Contingent upon document organizes as cover medium i.e. sound, video, picture, and content proper information concealing system or application is executed.

MATERIAL AND METHODS

PROPOSED METHOD

In numerical investigation and utilitarian examination, a discrete wavelet change (DWT) is any wavelet change for which the wavelets are unconnected inspected. Similarly, as with other wavelet changes, a key favorable position it has over Fourier changes is fleeting goals: it catches both recurrence and area data (area in time). Discrete wavelet changes are connected to discrete informational indexes and deliver discrete yields. Changing signs and information vectors by DWT is a procedure that looks like the quick Fourier change, the Fourier technique connected to a lot of discrete estimations.

Discrete wavelet changes delineate from the time area (the first or info information vector) to the wavelet space. The outcome is a vector of a similar size. Wavelet changes are straight, and they can be characterized by lattices of measurement n X n in the event that they are connected to contributions of size n. Contingent upon limit conditions, such grids can be either symmetrical or ''close'' to symmetrical (Narayanan et al 2012).

A picture that experiences Haar wavelet change will be isolated into four groups at each of the change level. The principal band speaks to the info picture sifted with a low pass channel and compacted to half. This band is additionally called 'guess'. The other three groups are called 'subtleties' where high pass channel is connected. These groups contain directional qualities. The extent of every one of the groups is additionally packed to half. In particular, the second band contains verti-

cal attributes, the third band demonstrates qualities the even way and the last band speaks to askew qualities of the information picture. Thoughtfully, Haar wavelet is extremely straightforward on the grounds that it is built from a square wave. In addition, Haar wavelet calculation is quick since it just contains two coefficients and it needn't bother with a brief cluster for staggered change.

3.1 LSB Technique

Pixels join to frame a picture and pixels contains primarily three shading segments known as RGB (Red, Blue and Green) Each segment is of one byte in which 8 bits are their out of which the first is most critical piece and last one is minimum noteworthy piece. In LSB method the minimum noteworthy piece is utilized for concealing the mystery data bringing about the adjustment in the last piece of every byte of the segment. So in the 3 bytes just last piece of every part is changed appeared in intense.

(00101101 00011101 11011100)
(10100110 11000101 00001100)
(11010010 10101100 01100011)

So overall half bits are changed to conceal the data. Mean: The mean is the number-crunching normal of a lot of values.

3.2 Algorithm of Data Embedding

Step 1: Get a video of (.avi) as an input of time 2 seconds.

Step 2: Sequence of cover video v and secret message s are taken from the video.

Step 3: Take the one frame as the cover image and hide secret image into cover image.

Step 4: Apply DWT on both the cover image and secret image.

Step 5: Secret image 2 level decomposition is fused into cover image.

Step 6: Apply Discrete Wavelet transform on that image.

Step 7: Stego video is created

3.3 Video Steganography Methodology

3.3.1 Movement Based MOT Stage

The movement based MOT calculation has been used in our model. The way toward recognizing the moving items in the video outlines must be done when movement protest locales are used as host information. These procedures is accomplished by recognizing each moving article inside an individual edge, and after that partner these recognitions all through the majority of the video outlines. The foundation subtraction strategy is connected to distinguish the moving articles dependent on the GMM (Gaussian mixture model). It likewise processes

the contrasts between back to back edges that produce the frontal area veil. At that point, the Kalman channel is utilized to foresee estimation direction of each moving area. Fig. 2 demonstrates various video outlines that contain numerous items and their closer view covers.

3.3.2 Information Embedding Stage

In whole video outlines, the host information of our proposed technique is the movement protests that are considered as districts of intrigue. By utilizing the movement based MOT calculation, the way toward identifying and following the movement districts over all video outlines are accomplished. The district of intrigue modified in every video outline is reliant on the number and the span of the moving articles.

3.3.3 Motion–Based Mot

Because of its different applications, PC vision is one of the quickest developing fields in software engineering. The discovery and following of moving items inside the PC vision field has as of late increased huge attention [1]. Proposed a cylinder and-bead based methodology for speaking to and dissecting movement directions. This paper tended to primary issues of movement directions in an instructive way. Right off the bat, a 3D tube is developed to speak to the directions. At that point a bead vector is gotten from the built 3D tube, which has the accompanying properties: 1) the movement data of a direction is looked after, 2) the whole logical example all through a direction is implanted, and 3) data about a direction in a conspicuous and bound together way is envisioned.

Another associated study is about long haul relationship following by tending to visual following issues caused by unexpected movement, substantial impediment, mishappening, and out-of-see. The strategy disintegrated the errand of following into interpretation and scale estimation of articles. The exactness and unwavering quality of the interpretation estimation is enhanced by thinking about the connection between's worldly settings, bringing about better effectiveness, precision, and heartiness contrasted with existing techniques for writing. The following of moving items is usually partitioned into two noteworthy stages: 1) recognition of moving articles in an individual video casing, and 2) relationship of these distinguished protests all through all video outlines so as to develop finish tracks.

LSB Coding-Least huge piece coding is the quick straightforward and mainstream technique to embed information in a sound record. In this strategy, LSB of twofold example of every example of digitized sound record is changed with double reporter of secret message. LSB coding considers the colossal information to be embedded.

Stage Coding-It address the cons of the commotion inciting technique for the video Steganography appeared in Fig. 2. It works by substituting the time of a beginning sound segment with a notice period which speaks to the data.

This strategy depends on the truth that period components of sound are not as detectable to the human ear as clamors seem to be. Rather than presenting unsettling influences, the strategy embeds the message bits into period move in period range of the computerized marker, accomplishing a difficult to hear distortion.

Equality Coding-It is one of the powerful systems of video steganography. Or maybe breaking a flag into separate parts, this system breaks a remarkable flag into various examples and embeds each piece of the secret message from an equality bit and if the equality bit of specific or chose region does not match the private piece to be embedded the strategy at that point reverses the LSB of one example in the region. Consequently, sender has more alternatives in encoding the secret piece.

Equality Coding-It is one of the powerful systems of video steganography. Or maybe breaking a flag into separate parts, this system breaks a remarkable flag into various examples and embeds each piece of the secret message from an equality bit and if the equality bit of specific or chose region does not match the private piece to be embedded the strategy at that point reverses the LSB of one example in the region. Consequently, sender has more alternatives in encoding the secret piece.

RESULTS AND DISCUSSION

The Advanced video Steganography strategy is exhibited in this paper. With the goal of unraveling the challenges like low implanting rate, security issues, adaptability to this our proposed technique has end up being an unrivaled response for Video Steganography. In Hlsb the record organizes arrange which was utilized was.avi however in this framework distinctive organizations can be utilized. What's more, there is almost no adjustment in the size and state of the stego record.

The sound quality isn't bargain in steganography process and consists of a few disadvantages. Therefore, our proposed Advanced Steganography strategy which isolates every pixel into sub pixels outflanked the current methods with numerous helpful highlights and gave better estimations of PSNR and MSE. The work that we have introduced in this paper understands inside the characterized extension better and secure calculations can be produced which won't just going to help in lessening the bending by acquiring better estimations of PSNR and MSE yet additionally going to make the framework increasingly secure for correspondence.

Table 1. Test videos used for testing the performance of the proposed system						
Cover-video					Secret data	
id	File	resolution	Frames	Size (MB)	Name	Size
c1	file1	104 ×104	15	130.1	data1.txt	1 KB
c2	file2	352 × 288	25	578	data2.txt	1 KB
c3	file3	104 × 104	30	247	mess.doc	1.45 KB
c4	file4	1380 × 960	20	76.8	secdat.doc	784 bytes
c5	file5	356 × 244	30	328.3	sec.txt	302 bytes

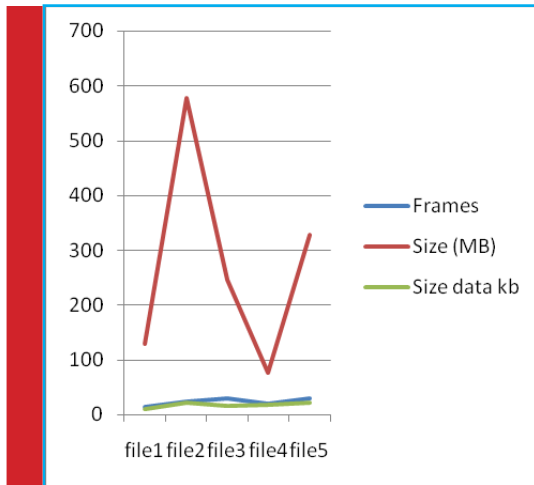| Table 2. Comparison table for PSNR & MSE			
File	PSNR	MSE	input characters
File 1	50.07	0.6	14
File 2	70.4	0.9	15

Figure 3. Video and files are Embedded Process as listed in chart
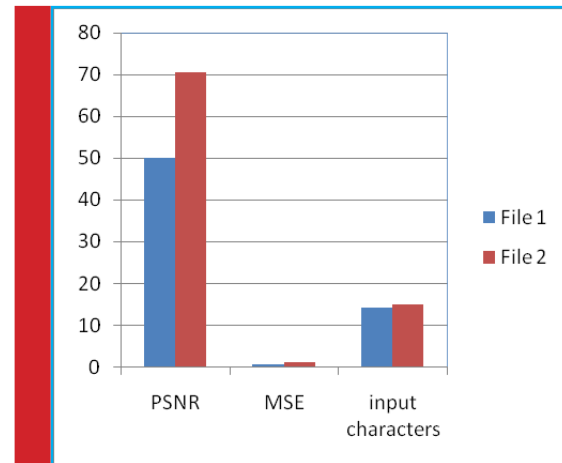
Figure 4. Comparison table for PSNR & MSE chart

In this table is listed for the no of sample video files and the secret files are embedded displayed.

Figure 4 shows better values of PSNR and MSE and these are obtained by replacing the least significant bits of the carrier image with the bits of stego image and dividing each pixel into sub pixel by using LSB technique.

CONCLUSION

A hearty and secure video steganography technique in DWT spaces dependent on MOT is proposed in this study. The proposed calculation is three-overlap: 1) the movement based MOT calculation, 2) information implanting, and 3) information extraction. The execution of our recommended technique is checked by means of broad examinations, exhibiting the high installing limit with a normal hiding ratio of 3.40% and 3.46% for DWT areas alone. A normal PSNR of 49.01 and 48.67 dBs for DWT spaces are accomplished prompting a superior visual quality for the proposed calculation when contrasted with existing techniques for the writing. The proposed calculation has used MOT as the preprocessing stage which thus gives a superior classification to the mystery message before implanting stage. In addition, through examinations from alternate points of view, the security and vigor of the technique against different assaults have been affirmed.

In our future work, we will apply our calculation in some other recurrence areas, for example, curve let change for further enhancing the effectiveness, visual quality, and security.

REFERENCES

Lakshmi Narayanan, Prabakaran, G and Bhavani, R (2012), 'A High Capacity Video Steganography Based on Integer Wavelet Transform', Journal of Computer Applications, Vol.5, Issue 4, pp. 358-365.

Mritha Ramalingam and Nor Ashidi Mat Isa (2014), 'Video-Steganography based on Integer Haar Wavelet Transforms for

Secured Data Transfer', Indian Journal of Science and Technology, Vol. 7, Issue 7, pp. 897–904.

Mustafa, RJ Elleithy, KM and Abdelfattah, E (2017), 'A Robust and Secure Video Steganography Method in DWT-DCT Domains Based on Multiple Object Tracking and ECC'.

Namrata Singh and Virendra Kumar Yadav, (2017), 'Trends in Digital Video Steganography: A Survey', International Journal of Computer Applications, Vol. 169 – Issue 7, pp. 6-18.

Nyo, HL Hlaing, AS and Maw, TW (2018), 'Secure Data Transmission Using Steganography and Twisted Exchange Algorithm', International Conference on Information Communication and Signal Processing (ICICSP).

Swathi, A and Jilani, SAK (2012), 'Video Steganography by LSB Substitution Using Different Polynomial Equations', International Journal Of Computational Engineering Research , Vol. 2, Issue 5, pp. 1620-1623.

Teotia, S and Srivastava, P (2018), 'Enhancing Audio and Video Steganography Technique Using Hybrid Algorithm', International Conference on Communication and Signal Processing (ICCSP).

Vipula Madhukar Wajgade and Suresh Kumar(2013), 'Enhancing Data Security Using Video Steganography', International Journal of Emerging Technology and Advanced Engineering, Vol. 3, Issue 4, pp. 549-552.

Enhanced RSA Encrypted AODV Routing Protocol for MANET

W.R. Salem Jeyaseelan[1]*, R. Madhumitha[2] and D. Yuvaraj[3]

[1,2]*Associate Professor, Department of Information Technology, Karpagam College of Engineering (Autonomous), Coimbatore-32, Tamilnadu, India*
[3]*Lecturer, Department of Computer Science and Engineering, Cihan University, Duhok, Kuridsitan Region Iraq*

ABSTRACT

A mobile Ad-hoc network (MANET) has become one of the most trending areas of research. MANETs play a vital role in communicating between various mobile nodes that are not connected through any wired channel. As the topic of interest has been increasing between the researcher's, many new sub areas has also started emerging one such being Ad-hoc On-Demand Distance Vector Routing (AODV). AODV protocol is used to remove gray hole and black hole attacks that occur frequently in a MANET. It is used only when a route between two nodes are not determined. This paper has enhanced the traditional AODV protocol by adding a RSA encryption technique. Transmitting messages securely in a network is one of the most important aspects of routing protocols. Experimental analysis shows how the encrypted AODV outperforms the traditional AODV routing protocol.

KEY WORDS: AD-HOC, AODV, MANET, ROUTING, RSA, ENCRYPTION

INTRODUCTION

Nodes transmitting data in the form of signals between one another in a network without any wired connections are popularly called as Wireless Networks (Bose et al, 2001). These networks are majorly implemented in the real world to reduce the number of wires that connect the various nodes in the network. The node could be anything, an antenna or a base station that frequently communicates with other nodes in the network by sending or receiving signals. MANETs (Mobile Ad-hoc networks) is a self-configuring network with no centralized administration. It has no fixed infrastructure as the topology is formed arbitrarily (Malatras et al., 2005). MANETs can only communicate when the broadcasting range is higher than the distance between the two
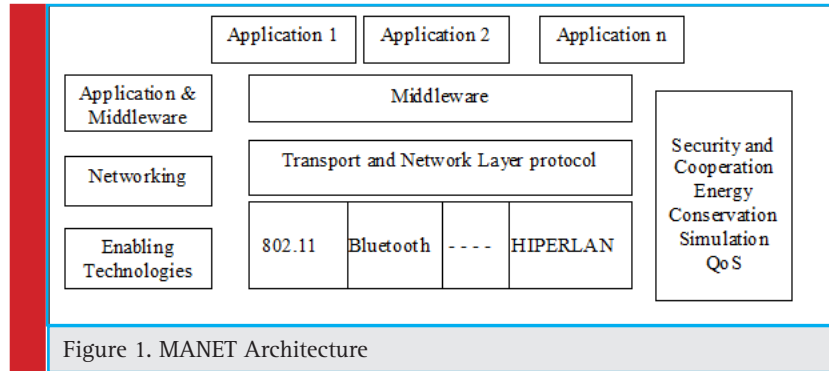
Figure 1. MANET Architecture

nodes that need to communicate (Basagni et al., 1998). Broadcasting is one of the best characteristic of wireless networks where the data is echoed to the entire nodes in the network unless like in the traditional network where only the receiver will be able to receive the data. Fig.1 shows the communication between various nodes in a mobile ad-hoc network. It consists several applications and security is provided to all the applications that are used for communication with one another.

There are various challenges and security attacks that encountered in a MANET (Sabeena Gnanaselvi and Ananthan, 2018). To avoid this numerous routing protocols those are designed for efficiently directing the packets from one node to another in a MANET. One such routing protocol is Ad-hoc On-Demand Distance Vector Routing (AODV) (Bhargava and Agrawal 2001; Das et al., 2003). As the name implies, routing in this protocol happens only when there is a need. The protocol is never used unless the routes already exist between two nodes. When the network fails to identify a route between any two nodes, then the AODV routing protocol is implemented.

A routing protocol is said to be efficient only when it finds the best route to a destination node from a source node which should also include minimal packet loss and transmission time (Macker, 1999). Other factors such as energy consumption and cost involved also need to be monitored. Implementation of routing protocols in real time is very complex and hence various simulators are being used for implementing these protocols. In this research work, NS2 (Network Simulator version 2) is used for effectively implementing the AODV protocol. The later sections include the overview of AODV protocol, its implementation, and experimental results.

A communication that doesn't need any wired medium for transmission of signals is known as wireless communication (Tse and Viswanath, 2005). They use air as the medium of passage for transmitting the signals. One of the best example is the Wi-Fi adapters that are placed in a workplace or a college campus. Our personal device such as laptops and mobile phones gets access to the internet connection provided by the adapters without any wired connections. With the growth of technology, wireless communications has become a very interesting topic for research. When many wireless devices are present in a common range and they transmit messages in the form of a signal from one device to another then that is said to be a wireless network (Jones et al., 2001). In a multi-hop wireless network (Biswas and Morris, 2005), the network uses more than one hop to transmit the messages from source to destination. MANETS are used in numerous applications these days(Loo, Mauri and Ortiz, 2016). Generally, a network consists of several nodes and these nodes need to communicate with one another in order to perform various operations assigned to them. Routing is a process used to select a path between the nodes or across multiple networks (Ramachandran et al., 2002).

Its main work is to decide on a decision that is based on directing the network packets from source node to destination node. This is achieved through intermediate nodes. Routing plays an important role in various types of networks which also includes circuit switched networks (Li et al., 2001).Routing is one of the most crucial research areas in Wireless Ad-hoc networks. Route selection and Packet forwarding are the tasks included in the routing process. In route selection, one or more routes are selected that connects one or more pair of nodes (Manjhi and Patel, 2012). The one-hop decision is taken to forward the packets by selecting a neighbor node across the chosen routes. Routing is one of the challenging problems encountered in the wireless medium as it is dynamic and lossy in nature.

Ad-hoc networks which are placed randomly in an environment finds its own next hop by the use of various protocols. Finding the best route from source to the destination node is called as routing. Multi-hop routing has many protocols through which the packets are transferred. Destination - Sequenced Distance Vector (DSDV) (Westphal, 2006) protocol periodically broadcasts the routing updates to each and every node in the network in a hop-by-hop fashion. Temporally-Ordered Rout-

ing Algorithm (TORA) (Park, and Corson, 1997; Park, 2001) uses a link reversal algorithm to discover routes in an on-demand fashion. Being a distributed protocol it quickly provides multiple routes to the destination node and minimizes the total communication overhead. Dynamic Source Routing (DSR) (Johnson, 1994 &1996) has a key advantage of not storing the updated routing information in each of the intermediate nodes. Hop-by-hop routing is replaced with source routing and periodic advertisement of the route for neighbor detection is eliminated. AODV (Agrawal et al. 2008; Vinothkumar et al.) combines the characteristics of both DSR and DSDV. Route discovery and route maintenance of DSR is combined with hop-by-hop routing feature of DSDV. There are many attacks that are encountered in a MANET. Some of them are grey hole and black hole attacks (Cai, 2010). These attacks degrade the security of the MANET network. Our paper mainly focuses on how these attacks are handled using AODV protocol. It will also elaborate on the implementation of AODV protocol in NS2 where even a novice will understand how to implement a protocol using the NS2 simulator.

MATERIAL AND METHODS

The AODV algorithm designed in this research paper enables self-starting, multi-hop and dynamic routing between all the participating nodes in the network which wish to establish and maintain a network between all the existing nodes. It also allows all the mobile nodes to quickly obtain new routes to its destination. The main advantage of an AODV routing protocol is its immediate response to line breakages. It also responds properly to any change in the network topology. The operations happening within the protocol is loop-free. Destination sequence number is present for each and every route in the network. When a decision needs to be taken between two routes, the route with the greatest sequence number is selected. There are three types of messages defined by AODV protocol: Route Requests (RREQs), Route Errors (RERRs) and Route Replies (RREPs). User Datagram Protocol (UDP) is used for the transportation of messages within the network.

Each route from source to destination node is entered in route table. The fields maintained inside the route table are:

- Destination IP Address
- Destination Sequence Number
- Valid Destination Sequence Number flag
- Other state and routing flags
- Network Interface
- Hop Count
- Next Hop
- Lifetime

This paper has enhanced the traditional AODV routing protocol to obtain better transmission. This is done by encrypting the messages that are transmitted in the network. The algorithms and the implementation of the Encryption enabled AODV Routing Protocol is discussed in the following sections.

C.1 Encryption Enabled AODV Routing Protocol:

This enables the AODV routing protocol with various encryption techniques. Encrypting the messages sent over the network enhances the security aspect of the transmission and also increases the performance of the entire network.

Algorithm:

Input: *Original AODV Message*
Hashing the corresponding Message using SHA 512 technique
for *Encryption of AODV message to a cipher text using RSA algorithm*

> *Transmission of cipher text from source to destination along with the hash values*
> *Decryption of Cipher text at the destination node using RSA technique*
> *Comparing the hash value generated at the source node and the decrypted AODV message at the receiver node*

end for
If *mismatch is found* then

> *Hash value is changed*

else
Message is not secured
end if
Output *the secure message*

C.2 Implementation Design:

The protocol is implemented using the NS2 simulator. Here all the nodes in the network are initialized and then the source and destination nodes are identified so as to transmit the messages between them. Fig. 2 gives the topology of the network where the nodes are initialized and the routes between them are indentified for the transmission of the messages. In the example that has been taken we can see that node 0 is the source node and nodes 20, 24 and 16 are the destination nodes. Now the network must choose the shortest path to reach the destination node. Here, node 7 sends a packet to node 6 and in Fig. 3 it is seen that node 6 sends an ACK message to node 7 that it has received the packet.

Figure 4 shows the way in which the destination node is selected. A black hole node is present in the network. This node is malicious and passing the message through that node would degrade the security of the message. Hence, the protocol selects a route that does not have
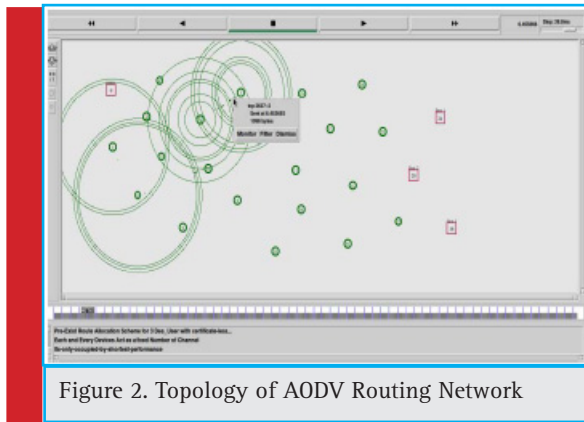
Figure 2. Topology of AODV Routing Network

Figure 3. Identifying various routes to destination

Figure 4. Emitting the routes having malicious nodes

the black hole node and transmits the message through that node.

RESULTS AND DISCUSSION

The transmission rate of the nodes while using the encrypted AODV protocol and traditional AODV protocol is plotted in Fig. 5. We can see the amount of increase in the transmission range for the encrypted AODV protocol.

Figure 5. Comparison of Transmission Rate

Figure 6. Comparison of Packet Loss

This also shows that there is a drastic decrease in node failure.

The packet loss of the protocols are also compared in Fig. 6. This is the most important aspect of the designed protocol. The message that is sent by the source should be received by the destination node without any packet loss.

Fig. 7 shows the comparison of the throughput between the two protocols which shows the increase in the performance rate of the network.
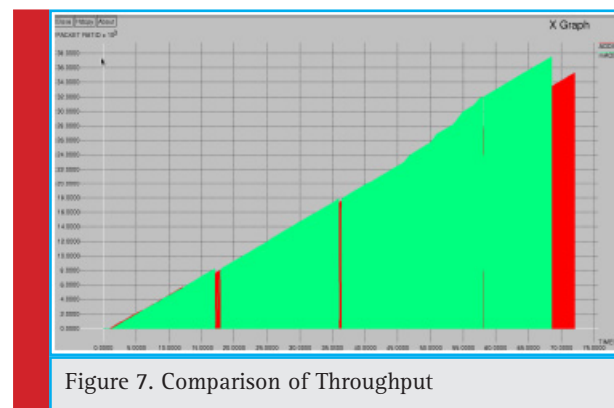
Figure 7. Comparison of Throughput

CONCLUSION

Routing protocols plays a significant role in routing the protocols from source to destination. One such protocol is AODV. Numerous attacks are degrading the security aspect of a MANET, one such being grey and black hole attacks. This paper has enhanced the AODV protocol with RSA encryption techniques to remove the attacks from the network. The algorithm encrypts the messages to a cipher text at the source node and decrypts it at the destination node. The experimental analysis between the traditional AODV and enhanced AODV protocols are done. It is seen that the enhanced AODV protocol has better throughput and less packet loss when compared to the traditional protocol. Use of other encryption techniques other than RSA could be considered as a future work.

REFERENCES

Agrawal, P Ghosh, RK and Das, SK (2008), 'Cooperative black and gray hole attacks in mobile ad hoc networks', In Proceedings of the 2nd international conference on Ubiquitous information management and communication, pp. 310-314.

Basagni, S Chlamtac, I Syrotiuk, VR and Woodward, BA (1998), 'Adistance routing effect algorithm for mobility (DREAM)', in the proceeding of International conference on Mobile computing and networking, pp. 76-84.

Bhargava, S and Agrawal, DP (2001), 'Security enhancements in AODV protocol for wireless ad hoc networks', in the proceeding of Vehicular Technology Conference (Vol. 4, pp. 2143-2147).

Biswas, S and Morris, R (2005), 'ExOR: opportunistic multi-hop routing for wireless networks', ACM SIGCOMM Computer Communication Review, Vol. 35, Issue 4, pp. 133-144.

Bose, P Morin, P Stojmenović, I and Urrutia, J (2001), 'Routing with guaranteed delivery in ad hoc wireless networks', Wireless networks, Vol. 7 Issue 6, pp. 609-616.

Cai, J., Yi, P., Chen, J., Wang, Z. and Liu, N., (2010), 'An adaptive approach to detecting black and gray hole attacks in ad hoc network', In Advanced Information Networking and Applications (AINA), pp. 775-780.

Das, SR Belding-Royer, EM and Perkins, CE (2003), 'Ad hoc on-demand distance vector (AODV) routing', RFC3561.

Johnson, DB and Maltz, DA (1996), 'Dynamic source routing in ad hoc wirelessnetworks', In Mobile computing proceedings, pp. 153-181.

Johnson, DB(1994), ' Routing in ad hoc networks of mobile hosts', Mobile Computing Systems and Applications Proceedings, pp. 158-163.

Jones, CE Sivalingam, KM Agrawal, P and Chen, JC (2001), 'A survey of energy efficient network protocols for wireless networks', wireless networks, vol. 7, issue 4, pp. 343-358.

Li, J Blake, C De Couto, DS Lee, HI and Morris, R (2001), 'The capacity of ad hoc wireless networks', In Proceedings of the 7th annual international conference on Mobile computing and networking , pp. 61-69.

Loo, J Mauri, JL and Ortiz, JH (2016), 'Mobile ad hoc networks: current status and future trends', CRC Press.

Macker, J (1999), 'Mobile ad hoc networking (MANET): Routing protocol performance issues and evaluation considerations'.

Malatras, A Pavlou, G Gouveris, S Sivavakeesar, S and Karakoidas, V (2005), 'Self-configuring and optimizing mobile ad hoc networks', in the proceeding of International Conference on Autonomic Computing (ICAC'05), pp. 372-373.

Manjhi, N and Patel, N, (2012), 'Signal strength based route selection in MANETs', International Journal of Computer Science and Telecommunications, Vol. 3, Issue 7, pp.27-30.

Park, V (2001), 'Temporally-ordered routing algorithm (TORA) version 1 functional specification', Internet Draft, draft-ietf-manet-tora-spec-04.

Park, VD and Corson, MS, (1997), 'A highly adaptive distributed routing algorithm for mobile wireless networks', In INFOCOM'97 Conference of the IEEE Computer and Communications Societies. Driving the Information Revolution, Vol. 3, pp. 1405-1413.

Ramachandran, B Rappaport, TS Annamalai, A Buehrer, RM Tranter, WH Radha, S Shanmugavel, S Rashid-Farrokhi, F Liu, KJ Tassiulas, L and Bambos, N, (2002), 'Wireless LAN medium access control and physical layer specification', Information Technology Journal, Vol. 4, Issue 2, pp. 148-161.

Sabeena Gnanaselvi, G Ananthan, TV (2018), '*An Analysis of Applications, Challenges and Security Attacks in MANET*', in the proceeding of International Journal of Computer Sciences and Engineering, Vol. 6, Issue.5, pp. 941-947.

Tse, D and Viswanath, P (2005) 'Fundamentals of wireless communication', Cambridge university press.

Vinoth Kumar K, Jayasankar T, Prabhakaran M and Srinivasan V (2017), Fuzzy Logic based Efficient Multipath Routing for Mobile Adhoc Networks, Appl. Math. Inf. Sci. Vol. 11, No. 2, pp. 449–455.

K.Vinoth Kumar and S.Bhavani (2015), Trust Based Multipath Authentication Protocol for Mobile Ad Hoc Network" **Journal of Computational and Theoretical Nanoscience**, Volume 12, Number 12, pp. 5479-5485(7).

K.Vinoth Kumar, Dr.S.Bhavani (2015),An Effective Localization based Optimized Energy Routing for MANET" Journal of Theoretical and Applied Information Technology, ISSN: 1992-8645, E-ISSN: 1817-3195, Vol. 77. No.2.

Westphal, C (2006), 'Opportunistic routing in dynamic ad hoc networks: The OPRAH protocol', In Mobile Adhoc and Sensor Systems International Conference, pp. 570-573.

BBRC
Bioscience Biotechnology
Research Communications

Fast FIC and SPIHT Coding with EHO Medical Image Compression

K.V. Swathi[1]*, V. Mohan[2] and P. Shanmugapriya[2]

[1]PG Scholar, Saranathan College of Engineering, Trichirapplli
[2]Associate Professor, Department of ECE, Saranathan College of Engineering, Trichirapplli

ABSTRACT

Fractal image coding involves with low bit rate of input images in the encoding stage and same part of images are decoded without degrading the quality of image during reconstruction. The major disadvantage of fractal image coding technique is time taken for encoding process is huge. This paper deals with fractal and SPIHT of WBCT coefficient in the encoding stage is proposed. Fast fractal coding uses Elephant Herd Optimization (EHO) is implemented in wavelet sub band based contour let transformation which involves with low pass and remaining coefficients are applied to modified set partition in hierarchical trees (SPIHT). In order to increase the speed of the encoding process, Elephant Heard Optimization (EHO) technique is used and coefficients of WBCT maintain the quality of images during smoothening process of images. Besides, image features and characteristics of wavelet progressive are conserved. The proposed algorithm contributes the better quality of image with low bit rate in reconstruction which is proved by experimental results.

KEY WORDS: REDUCES DOMAIN POOL SIZE, SUB BAND OF SPIHT CODING, WAVELET BASED CONTOUR LET TRANSFORM

INTRODUCTION

Fractal image coding is involved with natural images based on the redundancy occur in the image is exploited in terms of affine transformation. FIC is based on the natural image which is composed of information in the form of related and replication pattern is known as attractor. The two basic systems are utilized for modern fractal image coding which includes Iterated Func-

tion System (IFS) and Partition Iterated Function System (PIFS) (Mohan et.al.,2014). Following, each IFS is coded with coefficients (Thakur et al., 2007) as a contractive affine transformation. The bound on distance is formed between block of image to be encoded and IFS fixed point which is provided by collage theorem. It is utilized by the encoding process for finding IFS by means of fixed point is nearer to the image given.

In image compression, fractal transform was introduced by Barnsely and Demko (Barrnsely et.al.,1985). Jacquin, first introduced the fractal image compression scheme practically in 1992 (Jacquin,1992). The main demerit of FIC is consumes more time in encoding process. Hence, FIC plays a vital role in reducing the time in encoding process. In Fisher's classification approach, the image blocks are classified in 72 classes (Xing-Yuang et al., 2015) which is developed based on the variance and intensity (Polvere et al., 2000). Thus, by searching appropriate domain block for range block in an image (Li 2008). Every range block is converted into fractal code (Wohlberg et al., 1999). In Wang et al. (Wang Z. et al., 2000), deals with four range block types which are based on edge property of an image (Lu et al., 2003). By this method, the encoding time can be reduced from 1.6 to 5. Discrete Cosine Transform (DCT) involves with algorithm was proposed by Truong et al. (Truong et al., 2000), encoding time can be reduced by means of removing all the redundancy coefficients for dihedral blocks of domain image.

The stochastic optimization method which includes genetic algorithm (GA) is one of the approaches (Ming-Sheng et al., 2014) which deal with reduction of encoding time. In order to improve the efficiency, genetic algorithm (GA) (Wu et al., 2007, Teng et al., 2006) is proposed recently. The spatial correlation scheme is utilized in these methods.

Subsequently, these approaches are intended to reduce the encoding time for FIC and also developed some hybrid coders. Hence, the association between transform-based and fractal coder has been analyzed in (Caso et al., 1996)-(Hebert et al., 1998). Rinaldo and Calvagno (Rinoldo et.al.,1995) have represented diving pyramid coder which includes similarity to fractal contractive mapping in terms of interscale redundancy.

David has proposed a method that utilizes the elements of fractal and image compression (Thakur et al., 2007, Davis 1998, Davis 1995). The prediction operation is defined in wavelet domain for fractal contractive mapping is presented in (Asgari et al., 1997).

The interscale wavelet coefficients are predicted in Li and Kuo (Li et al., 1999) using fractal contractive mapping and prediction coefficients are encoded by utilizing bit plane wavelet coder. The coefficients of prediction in fractals are used to encode the whole image which has dissimilar procedure from (Rinoldo et al., 1995) and (Davis 1998) and other fractal conventional coders.

The plan of hybrid form of fractal wavelet coder is applied to discrete wavelet transform (DWT) of an image and fractal methods are to be implementing in the wavelet domain (Welstead S.,1999). The wavelet transformed image initially focuses on the upper most left corner on the image deals with the low pass values, fractal tech-

niques are implemented to sub band of wavelet domain coefficients. The main issue of executing the fractal image compression to wavelet transformed image that there is no adequate information in detail (Borkar et al., 2017).

The images are established with singularities and smooth discontinues, whereas wavelet is not found to be optimal solution in establishing the discontinues (Ellappan et al., 2014). The class of natural images are found to be adequate in texture mixed with smooth discontinues, the coefficient of wavelet do not establish the smooth contours. Thus, to improve the smooth contour, directional transform and geometrical are described in the literature.

Contourlet transform are used to represent smooth directional information in efficient manner which is present in the natural images. This transform involved with implementing two filter banks. Laplacian pyramidal decomposition is intended to generate band pass sub band and it is further examined with directional filter banks (DFB) (Hong et al., 2002), (Arthur da Cunha et al., 2006).

But the Laplacian pyramidal decomposition does not produce a compact sparse representation, instead the size of the sub bands produced are larger than the dimension of the image. Hence, contourlet transform is not preferred for image compression applications (Ramin Eslami et al., 2004, Phoong et al., 1995).

In (Hong et al., 2002), Hong and smith proposed have proposed a directional filter banks in octave band. The filter bank have the capacity to decompose the data in image to angular directional form and also to octave band involves with information of radial. In (Lu et al., 2003), Lu and Do have introduce non-separable filter bank which is implemented in single stage based on contourlet transform. In our proposed approach, input image is transformed using Wavelet- Based Contourlet Transform (WBCT) (Eslami et al., 2004). WBCT is utilized for directional performance of wavelet sub bands. Angular subband decomposition of wavelet detail subbands generates directional subbands. The relationship of parent and children is between the coefficients in different sub bands of WBCT subbands is different from that of the relationship between the coefficients in the wavelet representation. Repositioning the WBCT coefficients to create a wavelet subband zero trees is also proposed.

The remaining work of this paper is followed as: Section I also deals with review work of the Wavelet Based Contourlet transform and fractal image coding. Further section II explains about materials and method which includes EHO and proposed systems. The section III involves with result and discussion and section IV deals with the conclusion of the work.

The Angular decomposition of wavelet subbands using directional filter banks is the key process of wavelet based contourlet transform. The combination of DFB analysis and multi-resolution analysis performs sparse representation of an image (Mohan et al., 2011). Wavelet subband decomposition does not the split the frequency space representation of an image sharply. Hence, the number of directions selected for the further angular analysis of wavelet subbands will generate the subbands to represent the coefficients fall in a specific range of angles. Bamberger et al. proposed a minimally decimated 2-D DFB for perfect reconstruction. The filter bank consists of single level structured and it is utilized to fragment the images into several forms (Bamberger et al., 1992).

The estblishment of DFB proposed by Do (Do et al., 2003) which involves with Quincnux Filter Bank (Phoong et al., 1995) and it is adequate with filters and these are designed to absorb the high frequency component. The detail subbands at a particular wavelet scale are all further analyzed with equal number of directional decompositions using DFB. The maximum number of directional analysis is carried out on the wavelet sub bands of the finest scale. As to satisfy the anisotropy scaling law, the next consecutive scale of directional decomposition is decreased. The sample image involves with construction of WBCT is shown in figure 1.

Here, the wavelet scale of chidren-finer is twice the parent-coarse finer wavelet of directional sub band.

The WBCT coefficients are repositioned based on the relationship between coefficients at directional sub bands at a specific wavelet scale, so that coefficients can be scanned in the same way as specified in the Set

Partitioning in Hierarchical Tree algorithm for encoding for wavelet sub bands (Said et al., 1996). The representation of WBCT states that the coefficients of children will have twice the number of directional sub band as parent-coarser wavelet scale. The parent coefficient has four children which is located in two adjacent directional sub bands (Eslami et al., 2004, Phoong et al., 1995, Sundhakar et al., 2006, Duncan et al., 2003). At different scale, sub bands of vertical in rows are aligned to evolve the spatial orientation tree between the coefficients of wavelet.

A.2. Baseline of Fractal Image Coding – A Review

Fractal Image Coding is performed by the principles of Iteration Function System (IFS) which is governed by Collage Theorem and Contractive Mapping Fixed-Point Theorem. Non overlapping Range blocks of size L x L pixels of the image are encoded by the parameters describing the fractal affine transformation of domain block into range block (Muruganandham et al 2010). In a gray level image of size N x N pixels, the number of range blocks to be encoded is $(N/L)^2$. A domain block of size 2L x 2L pixels is performed with down sampling to obtain L x L pixels and it is denoted by u. For each range block v, a search in the pool of $(N - 2L + 1)^2$ domain blocks (Mohan et.al.,2014) is carried out to find the best matched domain block. The fractal affine transformation of a domain block is illustrated in fig. 2 and it is given by eqn. (1).

$$\phi \begin{bmatrix} x \\ y \\ u(x,y) \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & 0 \\ a_{21} & a_{22} & 0 \\ 0 & 0 & p \end{bmatrix} \begin{bmatrix} x \\ y \\ u(x,y) \end{bmatrix} + \begin{bmatrix} t_x \\ t_y \\ q \end{bmatrix}, \quad (1)$$

where the 2 x 2 sub-matrix $\begin{bmatrix} a_1 & a_2 \\ a_1 & a_2 \end{bmatrix}$ represents one of the operators used for Dihedral transformation. The decimated domain block u is affine transformed using the operators T_k: k = 0,. . .,7 and they are assigned as u_k, k = 0,1, . . . ,7, where $u_0 = u$. The operators are stated in eqn. (2).

$$T_0 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, T_1 = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}, \quad T_2 = \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix},$$
$$T_3 = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}, T_4 = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}, \quad T_5 = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}, \quad (2)$$
$$T_6 = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}, \quad T_7 = \begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$$

The closest block of range is chosen over a domain blocks based on eqn. (3).

$$d = \arg\min\{ \text{MSE}((p_k u_k + q_k), v) : k = 0,1,...,7\} \quad (3)$$

where

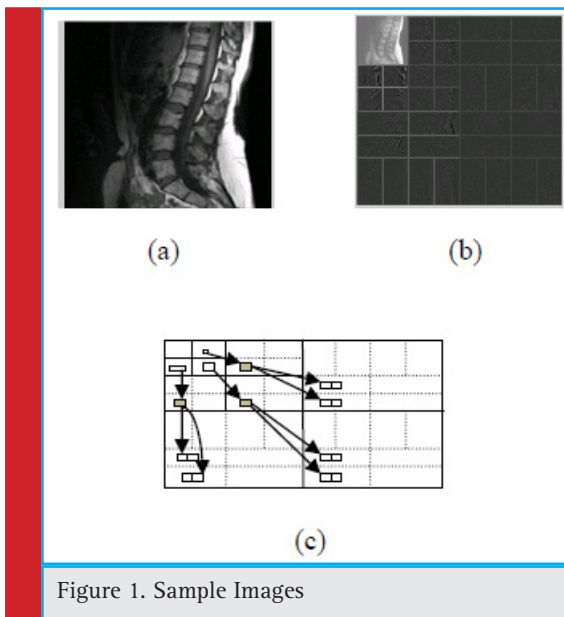$$MSE(u,v) = \frac{1}{L^2} \sum_{i,j=0}^{L-1} (u(i,j=0) - v(i,j))^2 \quad (4)$$
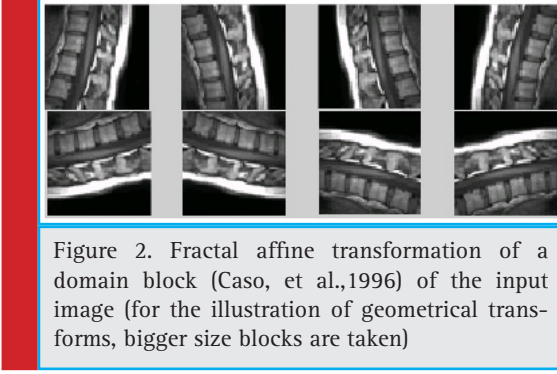

Figure 1. Sample Images

Figure 2. Fractal affine transformation of a domain block (Caso, et al.,1996) of the input image (for the illustration of geometrical transforms, bigger size blocks are taken)

The values of p_k and q_k can be computed from the following equations.

$$p_k = \frac{\left[L^2\langle u_k, v\rangle - \sum_{i=0}^{L-1}\sum_{j=0}^{L-1}u_k(i,j)\sum_{i=0}^{L-1}\sum_{j=0}^{L-1}v(i,j)\right]}{\left[L^2\langle u_k, u_k\rangle - \left(\sum_{i=0}^{L-1}\sum_{j=0}^{L-1}u_k(i,j)\right)^2\right]}, \quad (5)$$

$$q_k = \frac{1}{L^2}\left[\sum_{i=0}^{L-1}\sum_{j=0}^{L-1}v(i,j) - p_k\sum_{i=0}^{L-1}\sum_{j=0}^{L-1}u_k(i,j)\right]. \quad (6)$$

The terms t_x and t_y can be obtained together with d and the specific p and q corresponding the minimum d, for the given range block v, the affine transformation (1) is found.

Finally, a range block, v, is encoded by a set of parameters t_x, t_y, d, p, and q and the number of bits required to encode them are $\log_2(N)$, $\log_2(N)$, 3, 5, and 7 bits, respectively. Finally, v go through among all of the $(N/L)^2$ leads to completion of encoding process.

MATERIAL AND METHODS

A. Elephant Herd Optimization

Elephant Herding Optimization algorithm is one of the recent algorithm of swarm intelligence. EHO is highly nonlinear and multimodal globalization technique which is mainly based on the behavior of elephants. It is a good optimization technique for encapsulating the local search which is intended to obtain the best solution. The population of elephants has number of clans and they live under the governship of matriarch. Also have the social structures of female and calves. The clan consists of number of female as they live with their family whereas the male lives independently during grouping the elephants (Gai-ge Wang et al., 2015). Even though the male is away from the family it keeps contact along with the family in low frequency vibration.

In order to solve the globalization issue by the behavior of elephants heard follows certain rules:

(i) The population of elephants is formed by several clans and number of elephants is fixed in each clan.

(ii) A certain number of male elephants will live away from the family

(iii) The elephants live together in each clan under the matriarch.

There are two operators plays a vital role in Elephant Herd Optimization which includes: Clan updating operator and separating operator (Advances on Broad Band Wireless computing, 2018). Clan updating operator is utilized to update the number of individual elephants in a clan based on the position and fitness value of individual elephant. Separating operator is mainly intended to move the worst elephant in another clan.

CLAN UPDATING OPERATOR

In each clan, all elephants live under the matriarch. The next position for each elephant in clan ci is determined by matriarch of the clan (Gai-ge Wang et al., 2015). The individual elephant j in clan ci, can be updated by,

$$x_{new,ci,j} = x_{ci,j} + \alpha \times \left(x_{best,ci} - x_{ci,j}\right) \times r \quad (7)$$

From equation (7), the position of each elephant in clan can be updated. $\chi_{ci,j}$ is newly updated for individual elephant j in clan ci and $\chi_{new,ci,j}$ is old position of elephant in the clan. The scale factor of α [0, 1] that determines the influence of matriarch in clan on $\chi_{ci,j}$. $\chi_{best,ci}$ is the fittest elephant in the clan ci under the matriarch which is based on position of the elephant. Where r belongs to the range of [0, 1] and uniform distribution is utilized.

As only by having equation (7), fittest individual elephant in clan cannot be updated, that is $\chi_{ci,j} = \chi_{best,ci}$. To update the fittest elephant individual, it can be expressed as,

$$x_{new,ci,j} = \beta \times x_{center,ci} \quad (8)$$

The factor $\beta \in [0, 1]$ determines the influence of center of the clan $\chi_{center,ci}$ on $\chi_{new,ci,j}$. By having information about all the elephants in clan, the new individual elephant $\chi_{new,ci,j}$ can be generated by using eqn (8). The dimension of individual elephant can be calculated by using eqn (9),

$$x_{center,ci,d} = \frac{1}{n_{ci}} \times \sum_{j=1}^{n_{ci}} x_{ci,j,d} \quad (9)$$

where d-th dimension ranges between $1 \le d \le D$. The D indicates total dimension of the clan. n_{ci} is the number of elephants in each clan. $\chi_{ci,j,d}$ is the d-th dimension elephant individual in clan $\chi_{ci,j}$. Center of the clan $\chi_{center,ci}$ can be calculated via total dimension by using eqn (9).

SEPARATING OPERATOR

As population of elephant in each clan is sorted based on the fitness value, the worst elephant is replaced in

another clan. This operation is performed by separating operator. Those elephants which move from one clan to another clan are considered as male elephant. In order to improve the search ability, the worst elephant is replaced to another clan. It operates at each generation (Said A. et al., 1996) and can be calculated as,

$$x_{worst,ci} = x_{min} + \left(x_{max} - x_{min} + 1\right) \times rand \qquad (10)$$

where x_{max} and x_{min} are the topmost and bottom position of the individual elephant in clan respectively. $x_{worst,ci}$ is worst individual elephant in clan. rand belongs to the range of [0,1] which is based on stochastic distribution and uniform distribution.

Among the population of elephants, several numbers of clans are formed. Each clan consists of fixed number of elephants. The matriarch is chosen randomly at initial stage as shown in Figure 3. For each elephant calculate the position and fitness value over the matriarch. Sort the population in ascending order. Evaluate the best elephant based on position of elephants in clan. Compare the remaining elephants in clan with the best one and finds the closest elephant with respect to best individual elephant in clan. Then update the position of each clan elephant which also include best elephant

Figure 3. Flow chart of EHO Model

individual. Based on this, fitness value is updated for every elephant in each clan.

The worst elephants are identified among the elephants in clan as expressed in eqn (10). Those male elephants are moved away from the family. They are replaced to another clan by using separating operator. These performances operate at each generation. The situation comes to an end based on the counter value. The generation counter value should be less then maximum generation. If the condition exists, the process comes out of the loop and stopping situation attains. Finally, every elephants are grouped in a suitable clan and all elephants live under the leadership of matriarch.

B. Proposed System

The reduction of domain pool is one the method to decrease the time consumption in encoding process. This can be attain by size reduction of original image and by utilizing the fractal encoding, approximation band alone can be encoded. Wavelet based contourlet transform decays the image into different angular and radial sub bands. The input image is decomposed using 9/7 filter bank by means of utilizing mallet's subband decomposition. For images with smooth contours, Biorthogonal wavelet yields good sub band representation. Four sub band will produce at each decomposition level. They are approximated sub band (LL) and detail sub bands (LH, HL and HH) (Khullar 2011). Each subband will be half of the size of the input. Detail subbands at different goals are additionally examined utilizing dfbdec( ) work which is accessible in the controulet toolbox. For the directional decomposition filters are chosen such as PKVA filters which are proposed by Phoong, Kim, Vaidyanathan, and Ansari (Truong et al. 2000). They are of quincunx/fan filter type. The wavelet analysis filters are used to perform the three levels decomposition. The subbands of the finer level decomposition are analyzed to produce 8 directional decompositions (Mohan et al. 2011) and the second level are further decomposed with 4 directional decompositions and the subbands of coarser level are not decomposed further. The resultant coefficients are repositioned as coefficients are arranged is similar to DWT arrangements of an image.

As WBCT is applied, the dimension of input image is reduced by a factor of 2j and this leads to produce an approximation sub band, where j indicates several number of wavelet decomposition levels. The proposed work of fractal-WBCT coder, EHO is used in fast fractal encoding and k-restrictions is associated with it. The intuitive move is applied only to the approximation sub band and coding of modified SPIHT is applied to the repositioned sub band of WBCT transformed image.

The edge details are stored in the detail sub bands. This information is encoded by using modified SPIHT
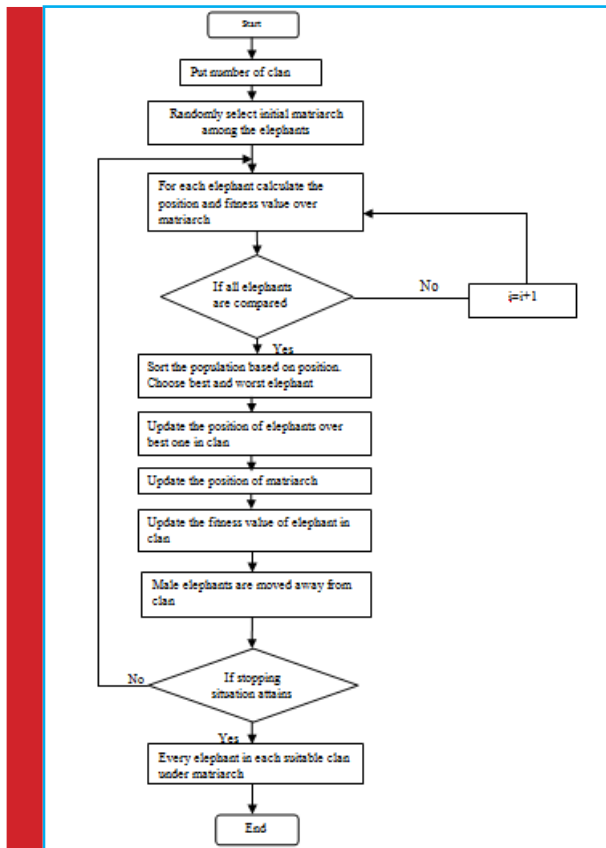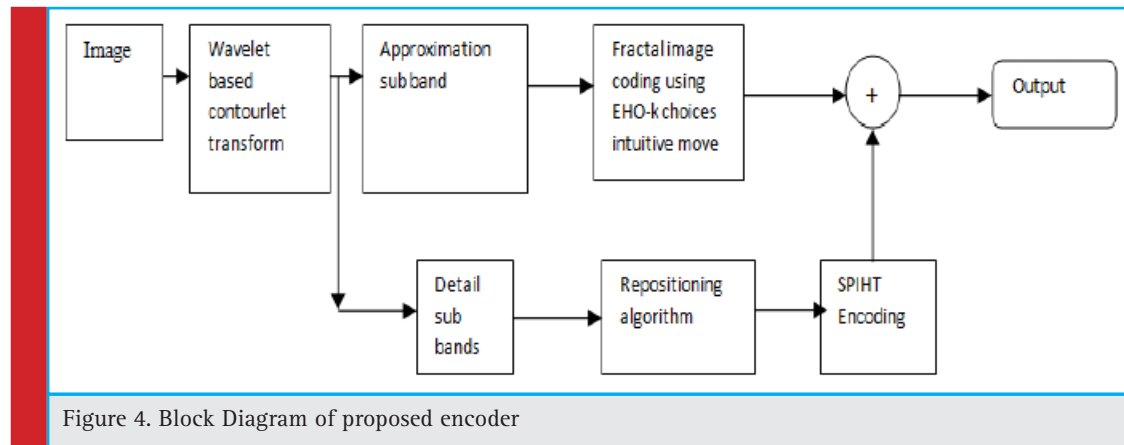
Figure 4. Block Diagram of proposed encoder

and it is transferred to the decoder. The proposed work of hybrid coder and decoder are shown in Fig. 4.

In the LIP initialization, the algorithm of SPIHT has been modified and this to be inserted in hybrid coder (Lu et al., 2003). The coefficients of approximation sub bands are preserved in LIP. In the proposed scheme, fractal technique is utilized and approximation sub band is encoded, also an empty subset is formed by initializing LIP.

The LSP and LIS lists have not been modified, since LSP is originally empty and LIS contains only the approximation sub band offspring. Also, the approximation sub band coefficients are excluded during the threshold computation, as to achieve better encoding of detail coefficients. Here FIC encoded using elephant herd optimization with k-restriction and intuitive move, which decreases encoding time of FIC by reducing the number of MSE comparisons. The target bit rate settings are allowed by original SPIHT algorithm, fractal coding stage is performed first by hybrid coder and then by utilizing first-order entropy (Borkar et al. 2017), bit budget is estimated. As to achieve the total target value, the remaining value of bit budget is utilized to perform the modified SPIHT.

Figure 5. Original 512 x 512 lumbar spinal t1 image
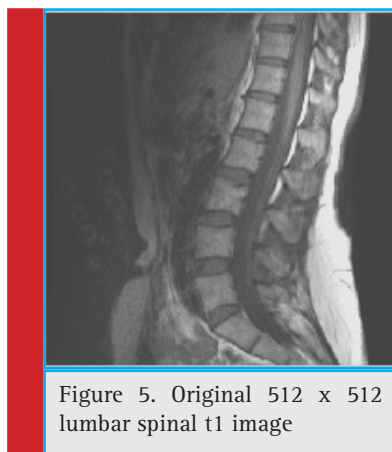
RESULTS AND DISCUSSION

The performances of the proposed fractal-SPIHT- WBCT coder are compared to the two traditional techniques viz., baseline FIC, FIC+DWT- SPIHT in terms of time taken for encoding, PSNR in dB, and PSNR in dB for Lumbar spinal T1- image. For FIC the parameters are quantized for scaling (p) at 5 bits and offset (q) at 7 bits. The PSO parameters population size and number of rounds are initialized based on the experiments.

Fig. 5 shows the original lumbar spinal t1 sagittal Image of 512 x 512 at 8 bpp. Fig. 6 shows the decoded image by the proposed fractal-wavelet coder at 0.25 bpp. The four methods are compared based on encoding time and PSNR parameters at bit rate of 0.25.

Figure 6. Decoded lumbar spinal t1 sagittal Image at 0.25 bits per pixel by the Proposed Fractal-WBCT and SPIHT coding
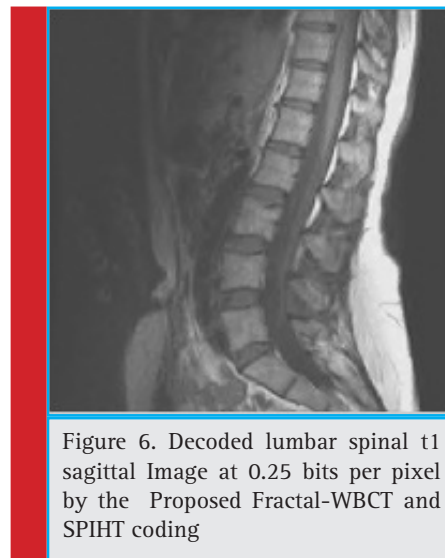
CONCLUSION

The compression ratio at a desirable rate of quality can be achieved by using Fractal Image Compression. The coding of SPIHT is useful during image transmission.

The encoding time in seconds and PSNR (dB) is calculated for compressed image of lumbar spinal sagittal (t1) with various combinations of methods at the bit rate of 0.25. The method of base line of full search FIC, the encoding time is 11096 and PSNR is about 37.78. The encoding time is 2630 and PSNR is 33.53 is obtained for combination of FIC with DWT and SPIHT method. The proposed fractal method is combined with WBCT and SPIHT coding has achieved the encoding time of 2120 and PSNR is about 34.32. For SPIHT, encoding time is less but the quality of image after decoding process is low at the bit rate of fractal coder. The encoding time can be reduced with 1.2 dB loss in quality of image by using PSO. Thus, the encoding time is reduced in our proposed work of fractal method with WBCT coder.

REFERENCES

Arthur L.da Cunha, Jianping Zhou, Minh N. Do (2006), "The Nonsubsampled Contourlet Transform: Theory, Design and Applications", IEEE Transactions on Image Processing, Vol. 15, No.10, pp. 3089–3101.

S. Asgari, T. Q. Nguyen, and W. A. Sethares (1997), "Wavelet-based fractal transforms for image coding with no search," presented at the IEEE Int. Conf. on Image Processing.

Abdul-Malik H. Y. Saad, Mohd Z. Abdullah (2018) "High speed Fractal Image Compression Featuring Deep Data Pipelining Strategy", IEEE Access.

"Advances on Broad-Band Wireless Computing, Communication and Applications", Springer Nature, 2018.

Barnsley, M. F. and Demko, S. G. (1985) "Iterated Function Systems and the Global Construction of Fractals." Proc. Roy. Soc. London, Ser. A 399, 243-275.

Bamberger.R.H, M. J. T. Smith (1992), "A filter bank for the directional decomposition of images: Theory and design", IEEE Trans. Signal Processing, vol. 40, no. 4, pp. 882–893.

Caso.G and C.-C. J. Kuo (1996), "New results for fractal/wavelet image compression," in Proc. SPIE Visual Communications and Image Processing, vol. 2727, Orlando, FL, pp. 536–547.

Caso, Gregory, C.-C. Jay Kuo, and Mark J. T. Smith (1996), "New results for fractal/wavelet image compression", Visual Communications and Image Processing 96.

Chun-Chieh Tseng, Jer-Guang Hsieh, Jyh-Horng Jeng (2008) "Fractal image compression using visual based particle swarm optimization", Image and Vision Computing.

G. M. Davis (1998), "A wavelet based analysis of fractal image compression," IEEE Trans. Image Process., vol. 7, no. 2, pp. 141–154.

G. M. Davis (1995), "Adaptative self-quantization of wavelet subtrees: a wavelet-based theory of fractal image compression," presented at the SPIE Conf. Wavelet Applications in Signal and Image Processing III, San Diego, CA.

M. N. Do and M. Vetterli (2003), "Contourlets in Beyond Wavelets", Academic Press, New York.

Duncan D., Po, Minh N. Do, Akram Aldroubi, and Andrew F. Laine (2003), "Directional multiscale statistical modeling of images", Wavelets Applications in Signal and Image Processing X.

R.C. Eberhart, J. Kennedy (1995), A new optimizer using particle swarm theory, in: Proceedings of IEEE International Symposium on Micro Machine and Human Science, Nagoya, Japan, pp. 39–43.

V. Ellappan, R. Samson Ravindran (2014), "An Effective Selection of DCT and DWT Coefficients for an Adaptive Medical Image Compression Technique Using Multiple Kernel FCM", International Review on Computers and Software (IREC OS), vol. 9, No. 4.

Ekta Borkar, A.V. Gokhale (2017), "Wavelet based fast fractal image compression", 2017 International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS).

Gai-Ge Wang, Suash Deb and Leandro dos S. Coelho (2015), "Elephant Herding Optimization", International Symposium on Computational and Business Intelligence.

D. Hebert and E. Soundararajan (1998), "Fast fractal image compression with triangulation wavelets," presented at the SPIE Conf. Wavelet Applications in Signal and Image Processing VI, San Diego, CA.

P. Hong and M. J. T. Smith (2002), "An octave-band family of nonredundant directional filter banks", IEEE proceedings of ICASSP, vol. 2, pp. 1165-1168.

A.E. Jacquin (1992), "Image coding based on a fractal theory of iterated contractive image transformations", IEEE Transactions on Signal Processing, vol. 1, no. 1, pp. 18–30.

J. Kennedy, R.C. Eberhart (1995), Particle swarm optimization, in: Proceedings of IEEE International Conference on Neural Networks, Perth, Australia, vol. 4, pp. 1942–1948.

Khullar, S. (2011), "Wavelet-based fMRI analysis: 3-D denoising, signal separation, and validation metrics", Neuroimage.

J. Li and C.-C. J. Kuo (1999), "Image compression with a hybrid wavelet-fractal coder," IEEE Trans. Image Process., vol. 8, no. 6, pp. 868–874.

Y. Lu and M. N. Do (2003), "CRISP-contourlets: a critically sampled directional multiresolution image representation," in proc. of SPIE conference on Wavelet Applications in Signal and Image Processing X, San Diego, USA.

P. Mukilan (2014) ,"Optimal Object Detection and Tracking Using Improved Particle Swarm Optimization (IPSO)", International Review on Computers and Software (IRECOS), vol. 9, No. 4.

V. Mohan and Y. Venkataramani (2011) "Compression of iris images using DTCNN based Wavelet decomposition and Directional Filter Bank analysis", 2011 International Conference on Communications and Signal Processing.

V. Mohan and Y.Venkataramani, "Medical Image Compression in WBCT Domain using fast FIC and SPIHT Coding" , International Review on Computers and Software (I.RE.CO.S.), Vol. 9, no. 6.

Muruganandham, A., and R.S.D. Wahida Banu (2010), "Adaptive fractal image compression using PSO", Procedia Computer Science.

M. Polvere, M. Nappi (2000),"Speed-up in fractal image coding: comparison of methods", IEEE Transactions on Image Processing, vol. 9, no. 6, pp. 1002–1009.

S. M. Phoong, C. W. Kim (1995), P. P. Vaidyanathan, and R. Ansari, "A new class of two- channel biorthogonal filter banks and wavelet bases," IEEE trans. on Signal Processing, vol. 43, no. 3, pp. 649-665.

Ramin Eslami, Hayder Radha (2004), "Wavelet-Based Contourlet Transform and its Application to Image Coding", IEEE International Conference on Image Processing (ICIP 2004), Vol. 5, pp. 3189-3192.

R. Rinaldo and G. Calvagno (1995), "Image coding by block prediction of multiresolution subimages," IEEE Trans. Image Process., vol. 4, no. 7, pp. 909–920.

A. Said andW. A. Pearlman (1996), "A new fast and efficient image coding based on set partitioning in hierarchical trees," IEEE Trans. Circuits, Syst. Video Technol., vol. 6, no. 3, pp. 243–250.

R. Sudhakar, R. Karthiga, and S. Jayaraman (2006), "Fingerprint Compression Using Contourlet Transform with Modified SPIHT Algorithm", Iranian Journal Of Electrical And Computer Engineering, Vol. 5, No. 1, Winter-Spring.

Thakur N. and Kakde O (2007), "Color Image Compression with Modified Fractal Coding on Spiral Architecture," Journal of Multimedia, vol. 2, no. 4, pp. 55-66.

T.K. Truong, J.H. Jeng, I.S. Reed, P.C. Lee, A.Q. Li (2000), "A fast encoding algorithm for fractal image compression using the DCT inner product", IEEE Transactions on Image Processing, vol. 9, no. 4, pp. 529–535.

M.S. Wu, W.C. Teng, J.H. Jeng, J.G. Hsieh (2006), "Spatial correlation genetic algorithm for fractal image compression", Chaos Solitons & Fractal, vol. 28, no. 2, pp. 497–510.

C. C. Tseng, J. G. Hsieh, and J. H. Jeng (2008), "Fractal image compression using visual-based particle swarm optimization," Image Vis. Comput., vol. 26, no. 8, pp. 1154–1162.

Viktor Tuba, Marko Beko and Milan Tuba (2017), "Performance of Elephant Herding Optimization Algorithm on CEC 2013 real parameter single objective optimization", WSEAS TRANSACTIONS on SYSTEMS, vol 16.

Vahdati, G, M Yaghoobi, and Mohammad R Akbarzadeh-T (2010), "Fractal Image Compression Based on Particle Swarm Optimization and Chaos Searching", International Conference on Computational Intelligence and Communication Networks.

Wohlberg B. and Jager G. (1999), "A Review of the Fractal Image Coding Literature," IEEE Transaction on Image Processing, vol. 8, no. 12, pp. 1716-1729.

Z. Wang, D. Zhang, Y.L. Yu (2000), "Hybrid image coding based on partial fractal mapping", Signal Processing: Image Communication , vol. 15, 767–779.

M.S. Wu, J.H. Jeng, J.G. Hsieh (2007), "Schema genetic algorithm for fractal image compression", Engineering Applications of Artificial Intelligence, vol. 20, pp. 531–538.

S. Welstead (1999), Fractal and Wavelet Image Compression Techniques. Bellingham, WA: SPIE.

Xing-Yuan, Wang, Wei Na, and Zhang Dou-Dou (2015), "Fractal image coding algorithm using particle swarm optimisation and hybrid quadtree partition scheme", IET Image Processing.

Xuebin Li. (2008) "A Hierarchical Classification Matching Scheme for Fractal Image Compression", Congress on Image and Signal Processing.

BBRC
Bioscience Biotechnology Research Communications

Secure Storage in AWS–MySQL using R–Programming

M. Malathy[1]*, K.S.K Karthik[2], M. Sushma Reddy[2], Sandeep Dogiparthi[2], Satish Devaguptapu[2] and G.A. Sai Kumar[2]

[1]*Professor, Department of CSE VelTech High Tech, Avadi, Chennai, India*
[2]*Final year CSE Students, VelTech High Tech, Avadi, Chennai, India*

ABSTRACT

'R' is a programming language with creates statistical analysis, analysing and reporting for a field which has a cleaned data. R Studio is a software which is a an open source and uses R programming to the operations.. Using R, we can handle databases created by MySQL. Many Different operations can be performed on MySQL and R using by predefined packages. To handle large set of data it may be structured data or unstructured data we can handle it through MySQL services. We address the problem of handling huge number of databases (BIG DATA ANALYTICS) in local storages like databases, data warehouses, Hard disks, Cloud Computing is the future of handling Big data issues and problems. This accommodates the problem by using one of the cloud web services called AWS "Amazon Web Services". A database based on student's data is our motive and handling it through RDS DB Instance (MySQL service provided) in EC2 Elastic cloud compute (LINUX) and retrieving it from R Environment i.e., R studio to provide statistical analysis for better use of analyzing large data. We use this asset as a live project and finding the development of the project in future with new motives and assets.

KEY WORDS: AWS, R ENVIRONMENT, MYSQL, LINUX

INTRODUCTION

Cloud Computing is most essential computing in computer science industry. There are many ways to feature and utilities in cloud computing. A computing paradigm is where there will be a large pool of systems which are connected in private or public networks (M. Sarala et al.

2016). To provide this type of dynamic and scalable infrastructure for an application, data and file storage. Using this type of technology the cost of the computation, application hosting, content storage and delivery has reduced significantly in the time period. Data Science is an enormous resource which is used to store and compute data (Fotopoulou et al. 2016).

The Big data is one of the approaches to it. To handle big data in terms of databases, datasets and data frames, Cloud Computing is the most suitable and resourceful technique (Chih-Lin et al. 2015). Handling those types of data in cloud express has various utilities towards it. According to Data Science & Cloud Computing Analysts, Handling

Data through cloud-computing is simpler than Analyzing. Taking this reference as a problem and to accommodate a solution providing analysis for large data through Statistical operations and provide the graphical outputs to that data is our solution. For this aspect, we are using AWS cloud-service with two essential products EC2 and RDS) and R-Programming Environment for statistical strategy (Zhang et al. 2016).

The authors (Manogaran et al. 2016) have proposed Big data security in cloud storage. The framework maintains the log file security and gives high impact of the future security system in cloud storage. The authors (Erturk et al. 2016) have reported how multimedia data stored in the Amazon cloud storage. Large volume smugmug Photos and videos are stored in the cloud storage. How the Amazon web services are provided storage with no initial fees for especially in the business application. The state-of art of Big Data in the cloud area research challenges are given in this technical paper (Skourletopoulos et al. 2014).

The main aim of this paper is to give awareness of the researchers and business people. In the pervasive network environment we need the distributed storage system with the large volume of unstructured data and Data analysis of data in cloud environment is very important. The brief idea about the web services given by the Amazon. The network environment is growing from LAN to cloud computing (Varia et al. 2014).

The service oriented architecture (SOA) provides the services in grid environment slowly improved cloud platform. It is reliable communication for the business and IT industry. The authors proposed the information about the Big Data analytics in the cloud services. It helps the data scientists, researchers in the field of software architects, software developers. The AWS is providing information about the legal issues of the services, cost, performance, scalability and interfaces. Big data analytics have to handle large volume of semi structured and unstructured data.The relationship between the two things Big data and Cloud, from that what are all the challenges and obstacles to maintain the relationship to transfer the data (Zanoon et al. 2017).

MATERIAL METHODS

A. Cloud computing

Cloud computing is a computing paradigm, where a large area of pool of systems are connected to a private network or public networks,to provide dynamically scal-

able infrastructure for application, data and file storage. Using this technology, the cost of the computation for application hosting, scalable storage and delivery are reduced significantly.

There are different types of cloud computing which includes (IAAS, SAAS, PAAS).

Forrester defines cloud computing as: "Services are scalable and user can only pay for the services he has used .Cloud Providers offer services that can be grouped into three categories.

1. Software as a Service (SaaS)
2. Platform as a Service (PaaS)
3. Infrastructure as a Service (IaaS)

B. Amazon Web Services(AWS)

Amazon Web Services (AWS) is a web services provider in cloud era which is establishedby the company called Amazon. AWSoffers a database Storage, content delivery and many other functionalities and services to help businesses infrastructure, scale and growth. To Explore it millions of customers who are currently using the services and leveraging AWS cloud products and solutions to build their sophisticated applications easil with increased flexibility, scalability and reliability to their business and their usage. Amazon Web Services (AWS) is a product of Amazon which provides on demand cloud-computing features with their services and different platforms to individuals, companies and governments. This will work on the basis of paid subscription basis which includes a free-tier option available for 12 months. Based on the usage of the services AWS charges the bill on his credibility. The application software such as web servers, databases, CRM, computer hardware are provided by them. Each AWS system also visualizes their console by using I/O (keyboard, display, and mouse) resources. All you need to work with AWS is a keen system with Internet applicability and requires a fast browsing in it. AWS provides a Authentication service to logon and use or service which we request on it.

C. There are many products which are developed by AWS

AWS provides many products, According to our usages and basic requirements and the need we can select that type of product. Some of them are:

- Amazon EC2
- Amazon S3
- Amazon RDS
- Amazon IAM
- Amazon SES, SNS
- AWS Elastic Beanstalk
- Amazon Elasticache
- Amazon Redshift
- Amazon Cloudfront... etc

D. Features of AWS used in our Project

- Amazon Elastic Cloud Computing (EC2): Amazon EC2 provides a virtual environment of different types of operating system with scalable computing capacity. Using Amazon EC2 it eliminates your need main in hardware upfront, so that you can develop and deploy applications faster with accuracy. You can use Amazon EC2 to launch virtual servers as many as you want, based on the charges of the instance which changes in different aspects and also configure security and networking, and manage storage.

- Amazon Relational Database Service (RDS): Amazon RDS is a web service which provides a specific instance in database with a required storage we need and their storage, that makes easy to set up, operate, and scale database (relational) in the cloud. It provides cost-efficient. RDS provides unique database instances such as MySQL, NoSQL, Oracle , DB2..etc

A. Resources and Utilities for implementation and fetching results

- MySQL: MySQL is a open source database software used for relational databases it is the most popular service used for structured data. MySQL is relational DBMS It is developed by MYSQL AB, which is a swedish company.

- "R": R is a programming language and software environment used for analysis, representation and reporting . Most of the statistical analysis are done through R graphical representation. R was created by Ross Ihaka and Robert Gentleman at the University of Auckland, New Zealand, and is currently developed by the R Development Core Team. R programming language can be interpreted with any programming language and any database service so that it can attract data and work computations on it. Most of the data analytics are worked by using this Language in most of the companies

- R studio: R Studio Connect allows users to share and collaborate on the results they produce with R, such as R Markdown documents, Shiny applications, and plots. It also has a premium product which is scalable than the free software and more costly. Source code or rendered artifacts can be deployed into R Studio Connect and selectively shared with other viewers and collaborators within the organization. Some content can even be scheduled to be re-executed and emailed on a given schedule.

R Studio Connect can also help simplify the role of the system administrator tasked with supporting R by offering:

1. Detailed metrics for the server and the associated R processes (coming soon).
2. Logs for all R processes spawned by Connect.
3. Secure deployments and interactions with artifacts
4. Scale a Shiny application beyond a single R process to support additional visitor load.

E. Proposed architecture

Architecture diagram using Amazon Web Services, we create a instance and connect it with RDS services provided by amazon, we use ubuntu server with Linux operating system then using RDS services we connect to R studio in a remote system to generate statistic operation. The figure 1 shows the proposed architecture of this project.
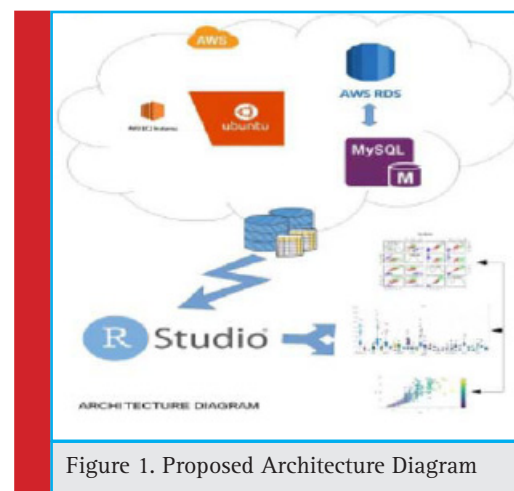
Figure 1. Proposed Architecture Diagram

a. Implementation

There are three phases of implementing the asset

Phase 1: Managing Connections.

Phase 2: Creation of databases and implementation of respective packages in R.

Phase 3: Analyzing data and implementing statistical operations.

Phase 1: Managing Connections:

- Implementation of large databases with client servers and connecting them to our systems, handling those databases through cloud and reading the IOPS regularly is the most important for this kind of technology.
- To accommodate the slow connections Linux operating systems helps in better way.
- Establishing AWS account.
- Launching EC2 and RDS instances.
- Setting up Linux on EC2 and MySQL server on RDS.

- Connecting EC2 instance on local computer by using terminal commands.
- Installing MySQL and R Software in Linux EC2 Instance by using Terminal commands.

Testing all Connections and provide Security features. The Figure 2 shows the connection established in AWS and created cloud storage using UBUNTU.
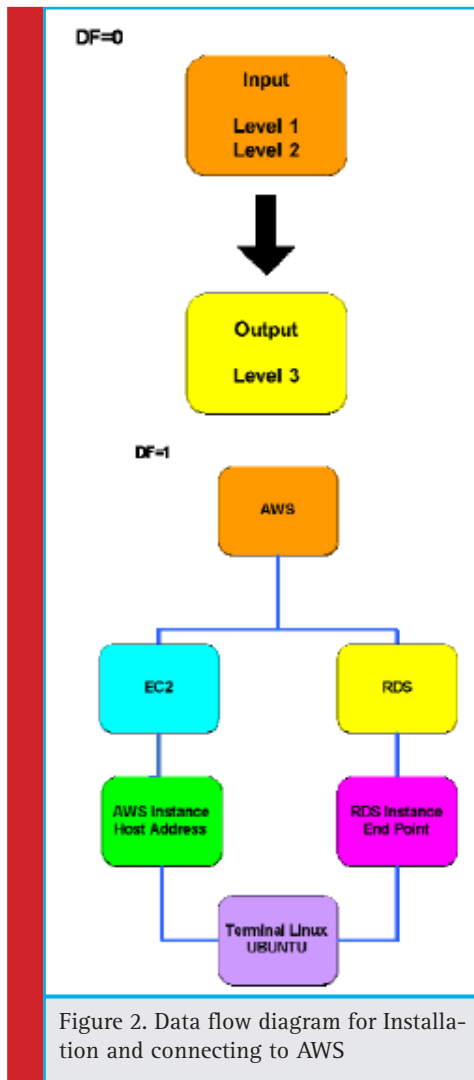

Figure 2. Data flow diagram for Installation and connecting to AWS

Phase 2: Creation of databases and implementation of respective packages in R:

- Creating large databases in MySQL schemas by using queries.
- The data may be Structured or Unstructured one. In this aspect, we use Structured.
- Two types of databases Ex: Students and Employee data.
- Installing various packages in R which are used for connecting the MySQL hosts and plotting the data
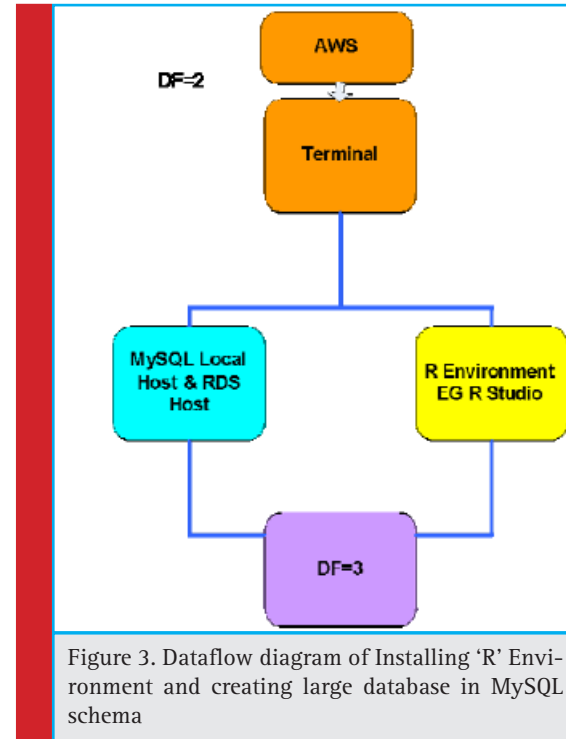
Figure 3. Dataflow diagram of Installing 'R' Environment and creating large database in MySQL schema

for analyzing. The Figure 3 shows the installing "R" programming in UBUNTU environment and creating large database in MySQL schema

Phase 3: Analyzing data and implementing statistical operations:

- Once the databases are created, handled through cloud are ready for analysis process.

Figure 4. Dataflow diagram of Statistical analysis operation in 'R' Environment

OUTPUTS:

1) Employee Database

2) Student Database:

• Using the connection with R and MySQL (RDS -> AWS) we can retrieve the databases.
• After getting the databases, they should be converted into either data frames or datasets.
• Once they are converted are fetched in results and will be able to plot.
• Plotting the above thing can be done in various forms of plots.
• These plots are ready and easy to analyses large data (BIG DATA).
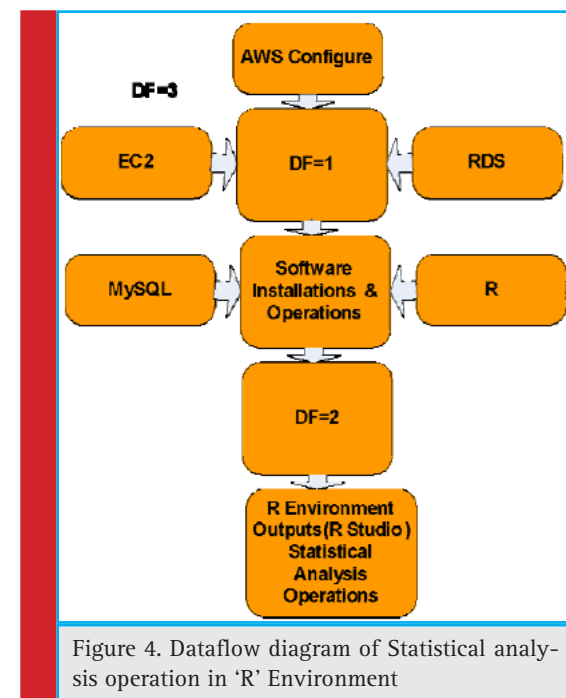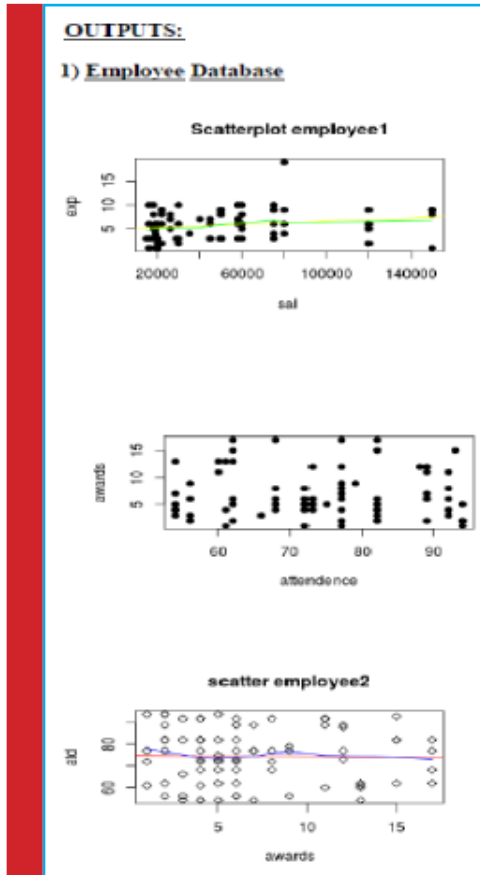• This is how Analyzation of large data can be processed through statistical operations. Figure 4 shows the Statistical analysis operation in 'R' Environment

RESULTS AND DISCUSSION

Experiment Results are shown in the Figure 5 Employee data analysis. Scatter plot shown based on experience how much salary the employees are getting. The x and y numeric vectors are salary and experience. Scatter matrices is the another way of statistical analysis to represent the award list of the employee based on the feedback.

Experiment Results are shown in the Figure 6 Student data analysis. Scatter plot shown attendance percentage of Final year and Third year students. The x and y numeric vectors are attendance and percentage.
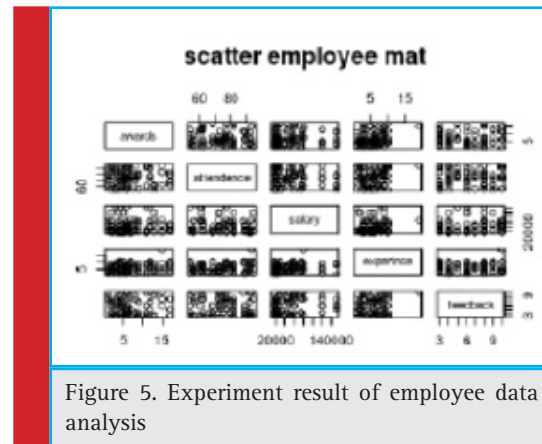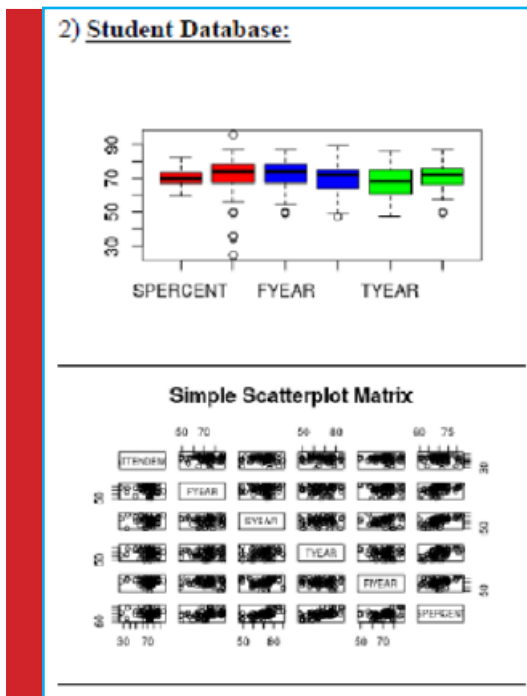
Figure 5. Experiment result of employee data analysis

CONCLUSION

According to expert's choice analyzing data is more essential than managing data the above aspect show how to create, manage data in cloud and how to retrieve the data in R Environment and how to analyses the data by using statistical operations. Each and every service provider is having different structure of the storage systems. Especially the AWS is one of the best service provider compare with other service providers. In this way,

• To work on the analysis R environment should be ready with all techniques.
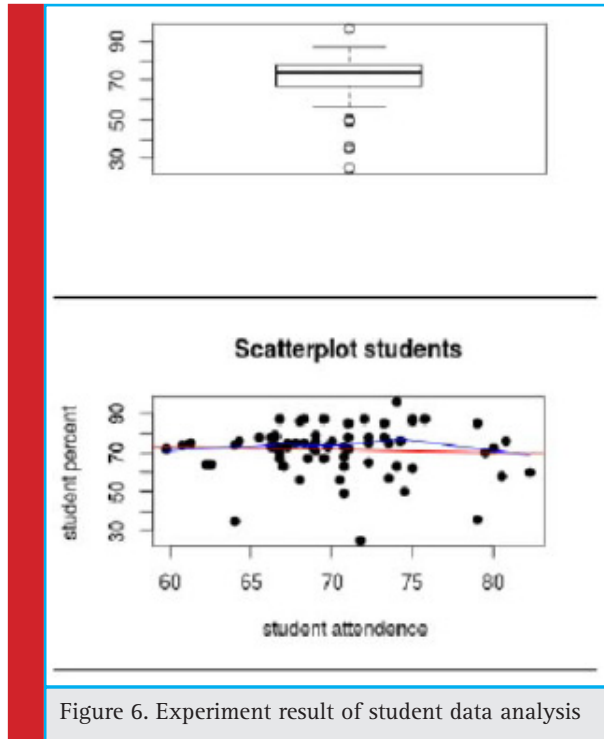
Figure 6. Experiment result of student data analysis

the future enhancement to use the AWS cloud services for medical data linkage of the patient health records.

REFERENCES

Chih-Lin, I., et al. (2015), On Big Data Analytics for Greener and Softer RAN, IEEE Access 3: 3068-3075.

Erturk, Emre, and Santiago Obrutsky (2016), Multimedia Storage in the Cloud using Amazon Web Services: Implications for Online Education, arXiv preprint arXiv:1608.07085 .

Fotopoulou, Eleni (2016), Linked data analytics in interdisciplinary studies: The health impact of air pollution in urban areas, IEEE Access 4: 149-164.

Manogaran, Gunasekaran, Chandu Thota, and M. Vijay Kumar (2016), Meta Cloud Data Storage architecture for Big Data security in cloud computing , Procedia Computer Science 87: 128-133.

M. Sarala, Vijayanand, & M. Malathy (2016), Effective application for detection of diseases from sclera image, Int. J. Advanced Networking and Applications, vol. 8, no. 4.

Skourlet opoulos, Georgios, et al. (2017), Big Data and Cloud Computing: A Survey of the State-of-the-Art and Research Challenges, Advances in Mobile Cloud Computing and Big Data in the 5G Era. Springer International Publishing, 23-41.

Varia, Jinesh, and Sajee Mathew, (2014). Overview of amazon web services, Amazon Web Services.

Yigzaw, Kassaye Yitbarek, Antonis Michalas, and Johan Gustav Bellika (2016), Secure and scalable statistical computation of questionnaire data in r, IEEE Access 4: 4635-4645.

Zanoon, Nabeel, Abdullah Al-Haj, and Sufian M. Khwaldeh (2017), Cloud Computing and Big Data is there a Relation between the Two: A Study, International Journal of Applied Engineering Research 12.17: 6970-6982.

Zhang, Yuan (2016), IEEE Access Special Section Editorial: Big Data analytics for Smart and connected health, IEEE Access 4: 9906-9909.

BBRC
Bioscience Biotechnology
Research Communications

Rank Based Energy Efficient Protocol for Manet (RBEE)

S. Baskaran[1]* and K. Logesh[2]

[1]*Associate Professor, Department of CSE, Kuppam Engineering College, AP, India*
[2]*Associate Professor & Head, Department of CSE, Kuppam Engineering College, AP, India*

ABSTRACT

Employment of trust methods in mobile ad hoc networks has been increasing in the recent years. Most of the existing security and trust methods rely on cryptographic and hashing schemes. These schemes consume more energy and produce processing and communication overheads in the network. Rank authentic residents employing fuzzy logic with minimum overhead designed to provide secure routing in mobile ad hoc networks. Because of frequent movements of nodes in networks, there may be link failure and energy drain which leads path loss and multiple route detections. The proposed implementation designed to monitor resident's activities, energy loss, path consistency, link disconnection counts and distance and update ring resident list to get the conviction of the nodes. Applying fuzzy logic nodes are categorized as residents and path nodes as per the environments. RBEE algorithm ranks the nodes before identifying the route to the destination applying fuzzy logic.

KEY WORDS: MANET, RESIDENTS, LINK DISCONNECTION, PATH CONSISTENCY, REDUNDANCY, RANK NODES

INTRODUCTION

Mobile adhoc networks (MANETs) have revolutionized the global communications by the channel and antenna tans receivers. Even if the MANET has restricted channels with other limitations as contrast to the global media, it gives mobile network formation. MANET is used for dynamic and fast operations with a huge number of devices, which is a system with broad choices

of data's such as planned networks, adversity relief situations, emergency and personal care networking in regions that are not tightly populated shown in figure 1.

The communications of a device is received by all neighbors within its coverage area due to the wireless behavior by antenna and other devices shares the messages through broadcasting, by this sharing all devices forms linked networks among the all devices in the network region.
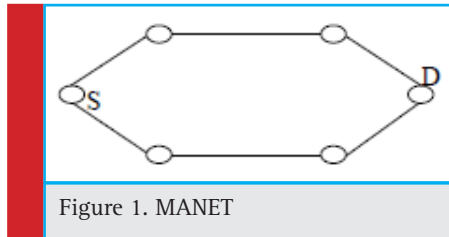
Figure 1. MANET

The proposed RBEE protocol implemented to minimize the control packets with secure manner and control the energy consumption by using fizzy optimization technique. Path established based on each node residents parameters and node has the knowledge to share the routing packets with minimum counts. Periodically nodes update the state changes about residents and assure the residents reliable quality and eliminate the suspect residents before path establishment.

Fuzzy controller with triangular membership method is applied in this implementation to optimize the neighbor selection. This method changes each sharp input into a set of fuzzy as variable. The fuzzy inference will work based on the form rules set then the defuzzification changes a fuzzy set into sharp output set. Node coverage is shown in figure 1.
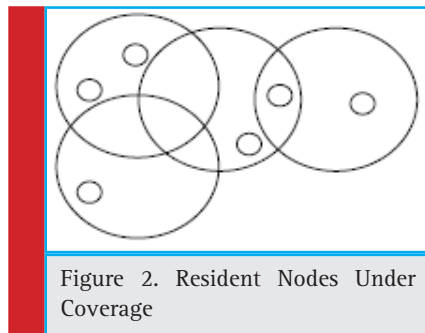

Figure 2. Resident Nodes Under Coverage

The mobile nodes can directly communicate each other can within the radio range whereas others need to communicate through the intermediate nodes (aarti et al. 2013) Thecollective study recommends the ways that can help in safeguarding the network by employing authentication techniques (Muhammad et al. 2016).

The trust mechanism is implemented in routing protocols to secure nodes and ensurethe secure data transmission (Sardar et al. 2013). A centralized supervisor and / or a pre-organized network infrastructure are not necessary for a MANET, thus making its deployment quick and economical. MANETs need to provide innumerable levels of security guarantees to diverse applications for their successful deployment and usage (Aravindh et al 2013). Multi-hop packet forwarding enabled the wireless transmission limit extension (Thenmozhi et al. 2014). Dynamic nature MANETs are highly vul-

nerable to different attacks. One of the basic requirements for a protected MANET is use of secure protocols which guarantee the network integrity, confidentiality, availability and authenticity (Ashish Kumar et al. 2015; Vinothkumar 2015).

In the Infrastructure based Ad hoc network, all the access points in the network are connected with the fixed back-bone and all the mobile nodes made moveable (Abolahasan et al. 2004). Trust management is one of the significant mechanisms in the security in networks and it is elucidated as a combined approach for construing security policies, credentials and relationships (Vijayan et al. 2016). The nodes in the ad hoc organization rapidly form the network whenever the communication is established (Helen et al. 2014). The nodes can move freely in any route. The nodes can disconnect and connect to the network arbitrarily (Neem Raza et al.) A MANET is a group of self-governing wireless mobile nodes which can exchange data in a lively manner. Due to the mobile behaviour of nodes the network construction is dynamic (Meenakshi et al.). In an ad-hoc network as these nodes have the flexibility of moving from one place to other, there may be cases where a specific node is a receiver for a particular packet, moves away from the range of sender (Sonali et al. 2013). MANET is a multi-hop wireless network; mobile nodes in this network create traffic to be forwarded to some other nodes or a group of nodes (Hajarathiah et al. 2016).

MATERIAL AND METHODS

PROPOSED METHOD

In MANETs, the reason behind the attackers attraction seeking is due to the existence of the unique qualities such as open medium, dynamic topologies, bandwidth constrains, distinct capacity links and physical security respectively. MANET nodes are liable to the distinct attacks that are launched by the compromised nodes. Computing power, bandwidth constrain and battery power are termed as the specific trade-offs between the security and resource consumption of the device.

RESIDENT NODES DETECTION

1. Exchange outstanding battery balance (OBB) across neighbors
2. Estimate transmission and receiving packets and its power utilization to get OBB
3. Grade node power ranking (NPR) from low to high in order from nodes resident (NR) region
4. Each node constructs their NR along with NPR
5. Each node needs to monitor nearby nodes endorsement is depicted in figure 3.
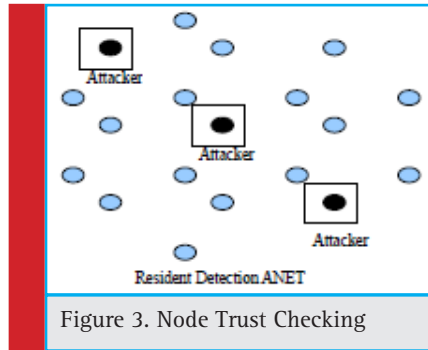
Figure 3. Node Trust Checking

AUTHENTIC RESIDENTS LIST SELECTION

When RREQ reaches destination, it replies with route reply (RREP) back to the source, by this way path established for current transmission. When RREQ send by s1 it enclosed the NRlist along with it. When NRnew updates each node add node validity column with complete new residents. Each node initially exchange NRlist along with its energy E, location, residents ID, count, validity of each resident, path consistency of resident (PCR), where r indicates the node coverage and the dist specifies the distance between resident nodes. Assume i and resident j have positioned as $(X1,Y1)$ and $(X2,Y2)$ in that in the order inside the network, where i and j of d_{sj} computed as

$$d_{sj} = \sqrt{\left(|X_1 - X_2|^2 |Y_1 - Y_2|^2\right)}$$

$$PCR = r - dist$$

Link disconnection count (LDC) computed as

$$LDC = \frac{dist}{speed}$$

If node j moved out of i coverage LDC will occur. Nodes remaining energy computed based on its number of communication participations as transmission and receiving packet counts called as used energy (UE). Based on that final energy loss rate (ELR) computed.

Node validity computed as the response received from residents in time. Each node monitor it residents, as per response with complete enclosed packet contents. If not node starts validity test with encryption of test data enclosed with its public key P key and additional question.

$$If(Node== New)$$

Send question and set reply time(q, P key)

$$a = a; b = b;$$

$$n = Tell\ the\ random\ prime\ number$$

$$(RPN)$$

$$c = a;\ d = b;$$

$$if(n != 0)RPN = (c,d)\ Mod(n)$$

Reply Decrypt RPN to Sender

All receiving nodes decrypt the test data and reply for the question as RPN considered as genuine node. Update genuine nodes in NR list as final residents is given in figure 4.
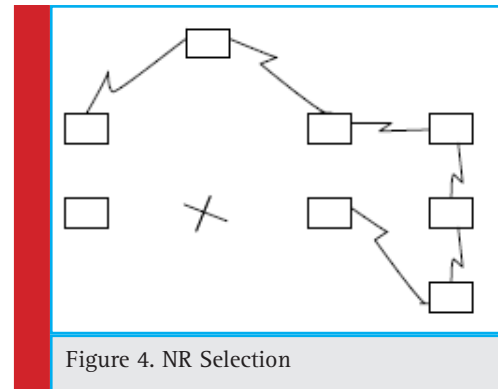
Figure 4. NR Selection

ROUTE SELECTION BASED ON GENUINE RESIDENTS

RANK NODES USING FUZZY LOGIC

Fuzzy logic can handle uncertainties and reasoning, which makes it very attractive for decision making systems. Fuzzy systems are used to approximate functions. The fuzzy can be used to model any continuous function or system. The quality of fuzzy approximation depends on the quality of the rules. The basic unit of fuzzy function approximation is "If-then" rules.

The rank quality which being attached by each node is resident in the way that number of transmission and receiving packet counts. Also the current E nodes with significant parameter are reviewed based on the node quality. Thus *LCD* and *PCR* of each node update will provide the fuzzy input. In RBEE, the overall performance is high when the node communicates with the node which is established.

Fuzzification is termed as the execution of shaping the sharp input rate to the equivalent fuzzy linguistic rates. Fuzzification is accepted by the membership function (*MF*) which is equalizing every sharp input the defuzzifier output between [0, 1]. The fuzzy based performance of the path selection uses the fuzzy interface m which is used to represent the appearance of the fuzzy logistic form. The set of fuzzy and the MF input given in the table 1.

Table 1. Fuzzy Set for the Output Variable		
Fuzzy Output		
Performance of Nodes	Low	
	Medium	
	High	

The table 1 represent the output variable obtained from the fuzzy sets. Subsequently, the performance of the node is being evaluated and pointed out in the given table. The fuzzy membership function evauated for the power consumption and battery cost is defined.

Conclusively, the fuzzy is being brought out in the fuzzified output. There consist of distinct path between the source and the destination and such paths may consist of various intermediate nodes between the path. The links for the source and destination can be termed as $p1,...,p2$ which is the available survive number of path. The following equation may specify the performance of each path from the sender and the receiver.

$$R_{sd} = \max{}_{l \in path}\left[Node(i), Node(j)\right]$$

From the upward node RREQ packet receives the node j_i and j_i knows the number of NR_s is received by the RREQ packet from the upstream node. Also j_i has the knowledge on the coverage set of the upward node residents and both the common residents list will need to be mark within its corresponding coverage range. Thus, node j_i will adjust the inappropriate NR list by the upward node (NR_{new}) set. Instead of broadcasting the NRP message the node will drop the RREQ packets which are received from the multiple nodes and update the new entry nodes.

To minimize the re-forwarding, the packets in the MANET will control the channel lock and also the bandwidth usage in each node is maintained to remission-time (RT) to re-forward. Only NR_{new} node will compute the RT and to make the list order to re-forward the RREQ packet. Subsequently, RT is used to judge there-forwarding order, expiring period, and the final node formation respectively.

$$RT_i = LongTime \times RR_i$$

The waiting delay is the long time and RR_i is the remission percentage of the node j. The RT makes a decision based on the order of the node re-forwarding. The node which has high residents with least RT will re-forward RREQ too many residents. By this way the minimum control packets can be established from the source and the destination. This will minimize the overheads in the network and minimize the node based on the time sequence.

$$RFV_i = \frac{NR_{new}}{N_i}$$

The Above mentioned equation specifies the percentage of the node received by the re-forwarding between the nodes in the deployed area. In case, the value of RFV_i is high then the RREQ will determine the distinct node which is being received. Conclusively, the destinations estimates the path received and also computes the total performance and send the route reply in the path connected.

RESULTS AND DISCUSSION

The network performances Rank Authentic Residents using Fuzzy logic with minimum Overheads in Mobile Ad hoc Networks (RBEE) is analyzed and compared with the FACES and TNCPR. The current implementation of the TNCPR in NS2 simulator is enhanced with reduced rebroadcasting technic in order to implement the RBEE.

This section provides the performance comparison of RBEE with TNCPR and FACES. This section presents the performance metrics what this thesis measure. We consider the values after 20 to 25 trials with different scenario. Performance metrics are evaluated from trace file, with the help of AWK program.

The proposed protocol is implemented in the working platform of Network Simulator -2 and its simulation parameter is explained in the below table 3.

| Table 3. Network Simulation Parameters	
Simulation Parameters	
Simulator	NS-2 (v. 2.34)
Routing Protocol	FACES, TNCPR, RBEE
Deployment Area	1000 m X 1000 m
Number of Nodes	50,55,60,65,70
Mobility	Random way point
Transmission Range	250 m
Bandwidth	2 Mbps
Interface Queue Length	50
Traffic Type	CBR
Packet Size	1024 bytes
Packet Rate	3 packets / sec
Pause Time	20s
Min Speed	1m/s
Max Speed	4m/s
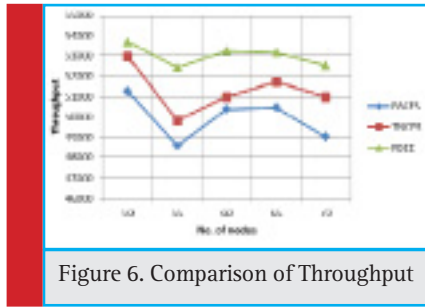
Figure 6. Comparison of Throughput
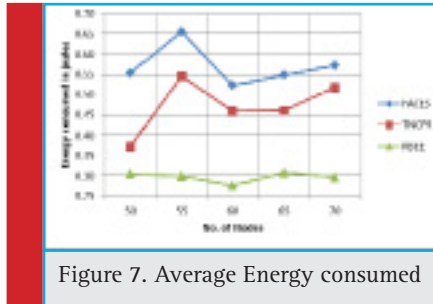
Figure 7. Average Energy consumed

The energy consumed during the transmission of packets in nodes is defined in the following figure 7 In our simulation we have used the receiving power as 1 W and the transmission power as 2 W. At the end of successful data transmission from the node 7 to node 12, average energy consumption observed that 0.25 joules improvement in the proposed RBEE protocol.

It is the sum of the number of data packets and the total number of control packets sent in the network. By default the density of the network increases the routing is overhead. The figure 8 provides the analysis of the control packets transmitted within the stipulated time period with different node density.

Fig. 9 shows that End-End delay for FACES, TNCPR and RBEE. FACES raises from 61.41% and it reaches a maximum level of 86.90%. TNCPR raises from 50.65% and it reaches 80.19%. RBEEraises from 44.62% and it reaches 53.45% when simulated for 60 nodes. The result depicts that, End-to-End delay for data transfer gets reduced by using TNCPR scheme instead of using FACES.
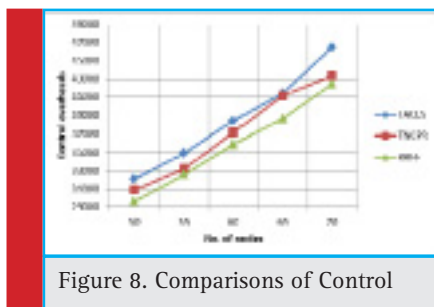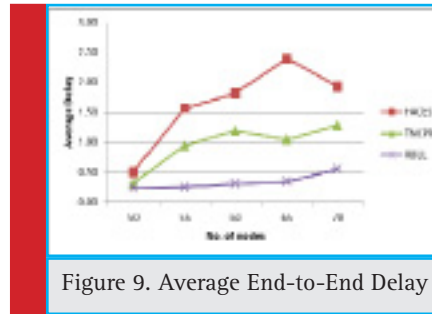

Figure 8. Comparisons of Control

Figure 9. Average End-to-End Delay

CONCLUSION

Rank authentic residents using fuzzy logic with minimum overhead designed to provide secure routing in mobile ad hoc networks. Due to frequent movements of nodes in networks, there may be link loss and energy drain which leads path loss and multiple route detections. The proposed implementation designed by monitoring resident's activities, energy loss, path consistency, link disconnection counts and distance and update ring resident list to get conviction of the nodes.

Using fuzzy logic nodes are categorized as residents and path nodes as per the environments. Also rank the nodes to forward the control packets to minimize the redundancy. The proposed RBEE protocol is implemented in the network simulator and evaluated in terms of efficiency in and QoS constraints respectively. Ultimately, the proposed RBEE protocol scores higher efficiency than existing protocols and forms efficient routing protocol for node energy consumption and QoS parameters respectively.

REFERENCES

Aarti D SS. Tyagi, (2013) Study Of MANET: Characteristics, Challenges, Application And Security Attacks. International Journal of Advanced Research in Computer Science and Software Engineering 3.5 Pages 252-257.

Abolhasan, M., Wysocki, T. & Dutkiewicz, E. (2004). A review of routing protocols for mobile ad hoc networks. Ad Hoc Networks, 2 (1), 1-22.

Akshai Aggarwal, Savita Gandhi, Nirbhay Chaubey, Naren Tada, Srushti Trivedi. (2014) NDTAODV: Neighbor Defense Technique for AD HOC On-Demand Distance Vector (AODV) to Mitigate Flood Attack in MANETS. International Journal of Computer Networks & Communications (IJCNC) Vol. 6, No.1, Pages 19-32.

Aravindh S, Vinoth R S and Vijayan R. 2013 "A Trust Based Approach for Detection and Isolation of Malicious Nodes in MANET", International Journal of Engineering and Technology (IJET), Vol 5 No 1, Pages 193-199.

Ashish Kumar Khare, R. C. Jain and J. L. Rana, (2015) A Review: Trust, Attacks and Security Challenges in MANET"Informatics Engineering, an International Journal (IEIJ), Vol. 3, No. 3, Pages 1-15.

Hajarathiah, K. Gnanendra, S. Tamilarasan, G. Ezra Sastry, S. SagarImambi, (2016) Manet Protocols For Reducing Routing Overheads. International Journal of Engineering Sciences & Research Technology. Pages 494-499.

Helen D and D. Arivazhagan, (2014). Applications, Advantages and Challenges of Ad Hoc Networks. Journal of Academia and Industrial Research (JAIR), Volume 2, Issue Pages 453–457.

Meenakshi Yadav, Nisha Uparosiya 2014. Survey on MANET: Routing Protocols, Advantages, Problems and Security. International Journal of Innovative Computer Science & Engineering, Volume 1 Issue 2, Pages 12-17

Mohit Jain, Satish Chand, (2016) Issues and Challenges in Node Connectivity in Mobile Ad Hoc Networks: A Holistic Review. Wireless Engineering and Technology. Pages 24-25

Muhammad Zunnurain Hussain, Muhammad Zulkifl Hasan, (2017). Collective Study On Security Threats In MANET. International Journal of Scientific & Technology Research Volume 6, Issue 01, Pages 32-37.

Naeem Raza, Muhammad Umar Aftab, Muhammad Qasim Akbar, Omair Ashraf, Muhammad Irfan, (2016) Mobile Ad-Hoc Networks Applications and Its Challenges. The Creative Commons Attribution International License, Pages 131-136.

Sardar, Mousumi, and Koushik Majumder, (2013). A Survey on Trust Based Secure Routing in MANET, Computer Science, Pages. 243–253

Sonali Gaikwad and Dr. D. S. Adane (2013) Reduction in routing overhead in MANET using 2-ACK scheme and Novel routing Algorithm. International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 8 Pages 3677-3681.

Thenmozhi K, E.Ramaraj, (2014) Routing Overhead in MANET - Minimization with Multipath Local Route Discovery Routing Protocol. International Journal of Engineering Trends and Technology (IJETT) – Volume 13, Pages 144-147

Vijayan R., Jeyanthi N. (2016), A Survey of Trust Management in Mobile Ad hoc Networks. International Journal of Applied Engineering Research ISSN 0973-4562 Volume 11, Number 4. pages 2833-2838

Virendra Singh Kushwah, Gaurav Sharma, (2007) Implementation of New Routing Protocol for Node Security in a Mobile Ad Hoc Network. International Journal of Computer Science and Security, (IJCSS), Volume (4): Issue (6). Pages 551-560.

Vinoth Kumar K, Jayasankar T, Prabhakaran M and Srinivasan V (2017), Fuzzy Logic based Efficient Multipath Routing for Mobile Adhoc Networks, Appl. Math. Inf. Sci. Vol. 11, No. 2, pp. 449–455.

Vinoth Kumar K S. Bhavani (2015), Trust Based Multipath Authentication Protocol for Mobile Ad Hoc Network" **Journal of Computational and Theoretical Nanoscience**, Volume 12, Number 12, pp. 5479-5485(7).

Vinoth Kumar K, S.Bhavani (2015), An Effective Localization based Optimized Energy Routing for MANET" Journal of Theoretical and Applied Information Technology, ISSN: 1992-8645, E-ISSN:1817-3195, Vol. 77. No. 2.

Zaiba Ishrat (2011) Security Issues, Challenges and Solution in MANET. International Journal of Current Science and Technology, vol. 2, Issue 4. Pages 108-112.

BBRC
Bioscience Biotechnology
Research Communications

Image Segmentation and Volume Estimation of Thyroid Nodules using Ultra Sound Image

R. Ponni[1]*, T. Jayasankar[2] and V. Jonce Anjaline[3]

[1]Research Scholar, Anna University, Chennai
[2]Dept of ECE, University of Engineering – BIT Campus, Tiruchirappalli
[3]MTPG Research Institute of Health Sciences, Karaikal

ABSTRACT

Thyroid is an endocrine gland that makes hormones it helps to control body glycolsis. Hyperthyroidisms, Hypothyroidism, goiter, in addition to thyroid nodules (benign/malignant) are the different thyroid disorders. When radiologists and physicians manually draw a complete shape of nodule, extracting heterogeneous features is a difficult task and it is difficult to distinguish what type of nodule is exists. This paper provides a concise overview about segmentation and volume estimation of thyroid nodules. Segmentation separates the pretentious region or province of curiosity commencing the supplementary tissues. PNN classifier is worn to categorize Thyroid statistics. These parameters for calculating the amount of thyroid are projected by means of element swarm improvement algorithm. Ultrasound systems have accomplished an excellent tradeoff between image qualities, low-cost, portability and fortune of any form of radiation. Simulation outcome of the thyroid shows that the area segmentation can be automatically achieved and the volume of thyroid nodule can be precisely estimated.

KEY WORDS: THYROID NODULES, ULTRASOUND IMAGING, SEGMENTATION, PNN CLASSIFIER

INTRODUCTION

We demonstrate an easy point of conclude the thyroid nodules in the thyroid with its quantity evaluation by using ultrasound image Thyroid nodules larger than 1cm may be detected clinically by palpation. Thyroid nodules less than 1 cm in diameter not clinically measurable if not to be found on the outside of the gland are much more frequent. The advantages of using ultrasonic imaging comprise its mobility and low cost as well as the facility to evaluate the measurement of the gland verify for the attendance of masses or cysts and calcu-

116

late the arrangement. A thyroid ultrasound examination provides an intention and accurate method for detection of a modify in the size of the nodule, used to estimate the US features, which include size, and composition, as well as presence or absence of coarse or, a halo and unbalanced margins. The improved image is used for segmentation and estimates the thyroid capacity, (Elangovan and Jeyaseelan 2016).

A. Thyroid

The thyroid is a tiny gland, created rather similar to a butterfly. These are situated in the slighter obverse division of the neckline, now lower the voice box and environment trachea. The thyroid provides hormones that are accepted in the blood to every tissue in the body. That utilizes regulate metabolism, or how the body consumes food into energy. It takes part in these by providing thyroid hormones. However tremendously fewer otherwise extreme quantity of these hormones cause a range of thyroid disorders. Figure 1 shows the thyroid gland.

Figure 1. Thyroid Gland.
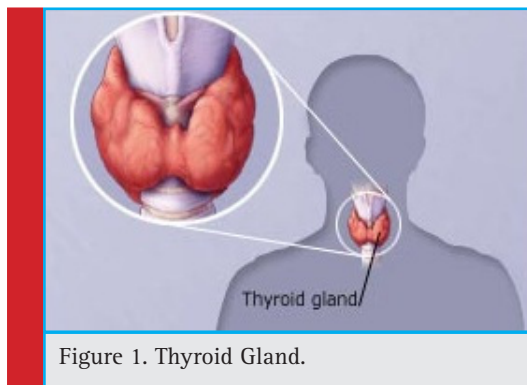
Thyroid disorders will affect the people in the age from 20 to 40. Women are easily affected by thyroid disorders than men in increasing. Thyroid problem will expand for the period of their pregnancy also. Thyroid sickness is due the following factors 1. Age 2. Gender 3. T_3-Serum triiodothronine 4. T_4-Serum thyroxine 5. TSH-Thyroid Stimulating Harmone 6. Iodine Intake 7. Medication for thyroid problems.

B. Symptoms of Different thyroid disorders

The thyroid diseases can be classified into two groups: First group affects the function of thyroid and the second group consist neoplasms, or tumors of the thyroid. General population is affected by both the types of disorders. Abnormalities of thyroid function are caused by the abnormal fabrication of thyroid hormones. Four most important types of thyroid diseases-hyperthyroidism (Extreme level of thyroid hormone), hypothyroidism (tiny amount of thyroid hormone), benign thyroid disor-

ders and thyroid cancer (Dhaygude et al., 2014 Elangovan and Jeyaseelan 2016).

There are 5 symptoms of specific thyroid problems:

Hyperthyroidism

This hyperthyroidism includes the following symptoms such as weight loss even in presence of increased hunger, increased heart rate, extreme perspiration, greater than before blood pressure, nervousness, heart palpitations, little or thinner canicular days, regular bowel arrangements and at period with looseness, muscle limitation, shaky hands, goiter escalation.

Adenosis

Adenosis includes the symptoms such as lesser heart rate, melancholy, time-consuming psychological processing, tiredness, more sensation to cold, lack of sensation or itchiness in the arms, goiter growth, uneven menstrual period, digestive problem, unhealthy hair and skin etc.

Acutethyroiditis

Gentle pain in the thyroid gland before sever pain, uneasiness with pain when rotating your head or swallow, manifestation to the above mentioned symptoms rapidly subsequent to a viral infection like measles, respiratory tract infection.

Nodules/Goiter

These types of symptoms involve in impenetrability feeling full, swallow, stress under the neck, rough tone and neckline gentleness.

Thyroid Cancer

Symptoms involve lumps in neckline, tone variation, and complexity in swallowing or inhalation and inflammation of chyle joint.

C. Thyroid nodule

Abnormalities /disorders in thyroid gland due to abnormal variations in size of thyroid tissues are called thyroid nodules. This nodules can also known as cystic or solid block in thyroid gland and it may be either a benign (non cancerous) or a malignant (cancerous). A thyroid nodule is shown in the figure 1. The abnormal cystic or solid block (lumps) growing inside the thyroid gland may represent various conditions including cancer (Savelonas et al., 2005).

The most of the thyroid nodules are benign and non cancerous. Digital image processing technique offers the opportunity for texture description. The thyroid cancer nodule can be characterized by texture description and quantifying properties such as smoothness, roughness and regularity.

MATERIAL AND METHODS

The proposed system focuses on diagnosis of thyroid nodules based on the segmentation of thyroid region and its volume estimation. An absolute infusion that uses a probabilistic Neural network (PNN) to mechanically sector of the thyroid gland is conceptualized. The proposed Particle Swarm Optimization (PSO) algorithm is used to calculate approximately thyroid quantity. In the training phase of the network, the rectangular Regions of Interest (ROI) at beginning the thyroid gland and non-thyroid cells are physically distinct.

A 6 textural skin tone extracted beginning the ROIs are used to train the PNN. The capable PNN can then approximately categorize the thyroid regions from the US descriptions. Finally, depending upon the region of segmented thyroid, breadth and deep thyroid gland, the volume of thyroid is estimated using a PSO algorithm (Chuan-Yu Chang et al., 2010).

A. Methods and Procedures

The various stages of proposed technique are US database (obtained from radiologist), image enhancement, feature extraction, segmentation using PNN and volume estimation as shown in figure 2. It provides a narrative approach for the extraction of noise free image features to representing textural properties of the thyroid tissue. By this widespread investigational estimation on the real thyroid ultrasound data, the accuracy in thyroid nodule finding has been increased. In Figure 2 the input image was subjected to speckle noise reduction using wavelet filter and the resulting pre-processed image was given to PNN classifier where it classified the image as malignant. The images are classified as normal, benign and malignant using PNN network and the results are displayed. If the thyroid image is found to be abnormal, segmentation is done using FCM clustering technique. Figure 3 shows the UT scanned image of thyroid hormone.

B. Thyroid Segmentation

In general, segmenting the image is the process of partitioning the image into multiple segments or set of pixel used to place the object and margins. Every pixels in local or global region which are similar with respect to characteristics such as intensity, colour, and brightness or texture of an image.It may be defined as interpretation of an image (Sahu et al., 2014).

If an image is enhanced properly by removing sound or it is the process of assembling the features/regions mutually that contributes identical characteristics. The different types of image based segmentation methods are

1. Efficient graph based segmentation
2. Hybrid segmentation,

3. ACM's (Active Contour Models)
4. Watershed,
5. Clustering methods & Neural Networks etc., (Khalandar Basha et al., 2013).

Figure 2. Task and Approach of Proposed System

Figure 3. UT Scanned Image of Thyroid Gland

C. Probabilistic Neural Network (PNN)

Probabilistic Neural Network (PNN) is a training tool or network in pattern recognition, nonlinear planning, estimation of class data probability and similarity proportion. Nonparametric methods are used to estimate the density functions, since the function of data density is not identified. The formation of PNN is similar to feed-forward neural networks. In fact Probabilistic Neural Network consists of layers such as input layer, pattern layer, summation layer and output (decision) layer. Figure 4 shows the structure of Probabilistic Neural Network (PNN) with binary pattern. Compared to the feed forward back propagation network Training of the PNN is much simpler (Haddadnia et al., 2013).
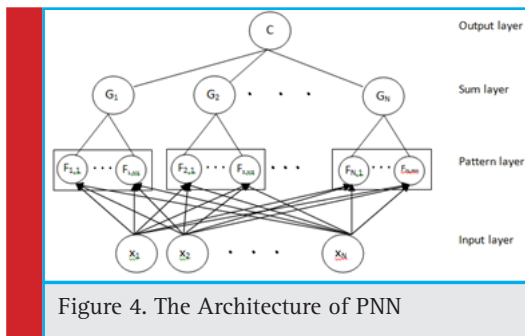
Figure 4. The Architecture of PNN

An input vector $X = (x_1, x_2, ... x_n)$ R^n is used for 'n' input neuron and it is given to the pattern layer.

$$F_{k,i}(X) = \frac{1}{(2\pi\sigma)^{n/2}} \exp(-\frac{\|X - X_{k,i}\|^2}{2\sigma^2}) \quad (1)$$

$R^n \in X_{k,i}$ is introduce the core center and ⊠ is the smoothing parameter. Probabilistic function estimate of conditional class is calculated by sum layer using eqn (2).

$$G_k(X) = \sum_{i=1}^{M_k} w_{ki} F_{k,i}(X), K \in \{1, ... k\} \quad (2)$$

Where
M_K - Number of neurons of class 'k' pattern W_{ki} - +ve factor
Using eqn (2) following equation is computed:

$$\sum_{i=1}^{M_k} w_{ki} = 1 \quad (3)$$

At the end, the vector of x pattern is given to the class which has the highest rate of function of Gk (Haddadnia et al., 2013).

$$C(X) = \arg \max_{1 \leq k \leq k} (G_k) \quad (4)$$

D. Volume Estimation of thyroid nodule

Ultra sound imaging technique is the most widely used tool in clinical diagnosis since Computed Tomography (CT) imaging is costly and it emits harmful radiation during imaging. A complete solution is proposed in this paper to calculate the volume of the thyroid gland directly from Ultra sound images.

PSO (Particle Swarm Optimization) algorithm

PSO algorithm is used to obtain a set of potential solutions that evolve to approach a suitable solution for thyroid problem. PSO algorithm has strengths of quick convergence and forceful permanence over other evolutionary optimization methods, such as GA or ACO algorithms. In this method, the level and unfairness parameters for volume estimation can be directly estimated from the Ultra sound images. Figure 5 represents the step by step description of PSO algorithm.

Thyroid volume equation can be defined by PSO algorithm to estimate parameters

$$Volume_{US} = a \times (Area_L \times D_L + Area_R \times D_R) + b \quad (4)$$

The Mean Square Error (MSE) between the volume calculated from CT and the estimated volume was applied to evaluate the accuracy of the estimated volume (Chuan-Yu Chang et al., 2008).

Figure 5. Description of Flow chart.

Figure 6. Indicating the Presence of Thyroid Region

RESULT AND DISCUSSION

The ultrasound thyroid images are taken and pre-processed using wavelet filter in MATLAB environment. The images are classified as normal, benign and malignant using Probabilistic Neural Network (PNN) and the results are displayed. If the thyroid image is found to be abnormal, segmentation is done using FCM clustering technique. Figure 6 shows the presence of thyroid hormone.
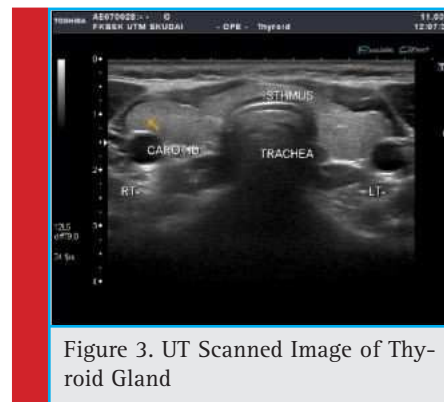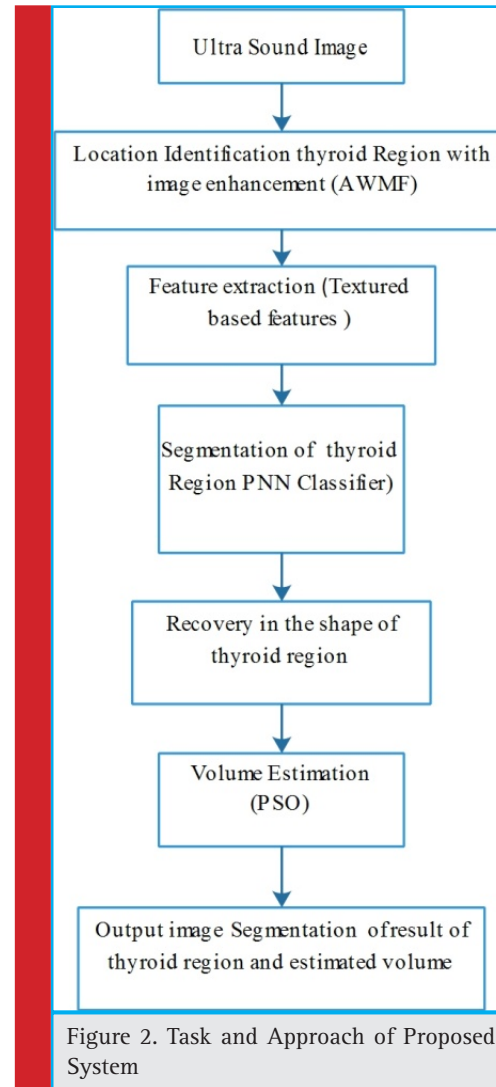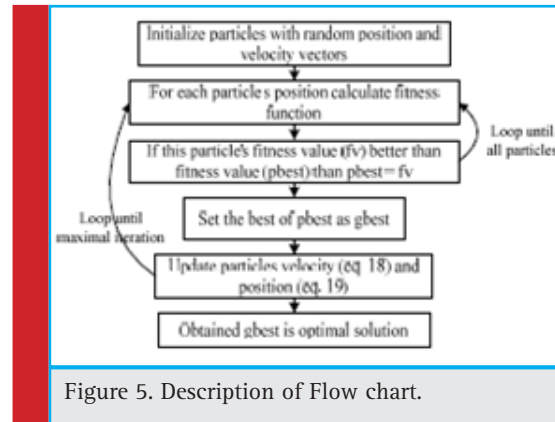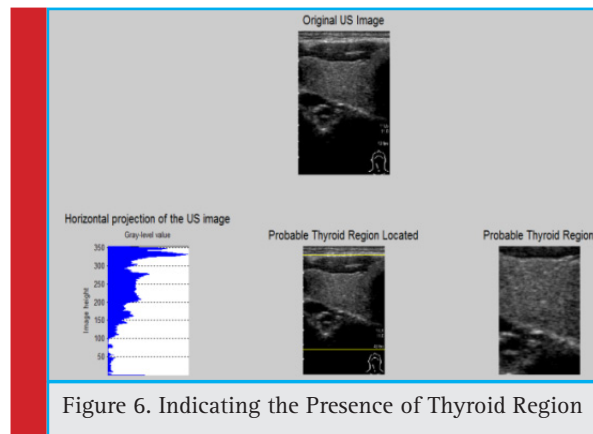
CONCLUSION

In this proposed method, enhancement processing is done to remove speckle noise which affects the segmentation results of the thyroid gland region obtained from ultra sound images. The possible thyroid gland region is located in the US image, and then the regions are classified in to thyroid and non-thyroid gland areas by the PNN classifier.

After classification, region growing method is applied to recover an accurate shape of the thyroid gland region and the volume of thyroid is estimated by using PSO algorithm. The proposed method can be used to segment the thyroid gland region, classify the thyroid nodules (benign/ malignant) and estimate level of thyroid directly from Ultra sound (US) image.

REFERENCES

Aarthi Poornima Elangovan, Jeyaseelan T., (2016), Design of Ultrafast Imaging System for Thyroid Nodule Detection, International Research Journal of Engineering and Technology, Vol. 03, no. 02, pp. 1221-1225.

Chuan-Yu Chang, Yue-Fong Lei, Chin-Hsiao Tseng, Shyang-Rong Shih (2010), Thyroid Segmentation and Volume Estimation in Ultrasound Images, IEEE Transactions on Biomedical Engineering, vol. 57, no. 6, pp. 1348-1357.

Chuan-Yu Chang, Yue-Fong Lei, Chin-Hsiao Tseng, Shyang-Rong Shih, (2008), Thyroid segmentation and volume estimation in ultrasound images', IEEE International Conference on Systems, Man and Cybernetics, Singapore, 2008, pp. 3442-3447.

Javad Haddadnia, Omid Rahmani Seryasat, Hamidreza Rabiee, (2013), Thyroid Diseases Diagnosis Using Probabilistic Neural Network and Principal Component Analysis, Journal of Basic and Applied Science Research, vol. 3, Iss. 2, pp.593-598.

Khalandar Basha, G. Srinivas Reddy, T.Venkat Narayana Rao, (2013), Enhanced Contour based Segmentation for Fingerprint Extraction, International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 3, Iss. 2, pp. 277-281.

Sahu PK , Dinesh P, and Kumar Whavnani, (2014) Thyroid Segmenetation and Area Measurement using Active Contour, International Journal of Engineering and Advanced Technology (IJEAT), Vol.3, Iss.5, pp. 303-307.

Dhaygude P, (2014), A Review of Thyroid Disorder Detection Using Medical Images, International Journal on Recent and Innovation Trends in Computing and Communication, Vol. 2, Iss.12, pp. 4194- 4197.

Savelonas, D. Maroulis, D. Iakovidis (2005), S. Karkanis, N. Dimitropoulos, A variable background active contour model for automatic detection of thyroid nodules in ultrasound images, IEEE International Conference on Image Processing.

BBRC
Bioscience Biotechnology
Research Communications

Design and Simulation of Wireless Sensor Network based Intelligent Driver Permit Card (IDPC) System

P. Rajasekar* and T. Pasupathi
Research Scholar, Anna University, Chennai

ABSTRACT

To prevent illegal licenses and therefore causing accidents, a new automated system is proposed. This system is implemented using machine-learning approach and feature extraction algorithm. A system is modeled for understanding the driver behavior and this is implemented towards improving the safety. This paper focuses on implementing a wireless sensor vehicle node and LABVIEW based embedded data logger for automatic vehicle riding pattern recognition, based on machine-learning approach. Result analysis is done by comparing the received data with previous data.

KEY WORDS: WSN, MACHINE LEARNING, LABVIEW, PERMIT CARD, PATTERN RECOGNITION

INTRODUCTION

The evolving technology introduces much progress thereby reduces the manpower and time consumption in day to day life. A driving license is an official document issued by regional transport office certifying that the holder eligible and qualified to drive a motor vehicle. As per the survey, every 30 seconds one person dies in road accident due to untrained driving by illegal license holders. So it is very important to disassociate the driving ability test from the licensing authority. In spite of continued efforts made by the government in India, various organizations continue to highlight the fatalities on the roads caused by conflicting process of issuing driving licenses across India. Based on the independent survey conducted, that close to 60 percent of license holders have not undergone the driving license test and 54 percent of them are untrained to drive (Marianne Bertrand et al., 2007).

As agents promotes corruption and resulting in higher payment for obtaining driving license, thereby reduces driving test skills quality and in unskilled drivers on road (The Times of India, 2010). To overcome this problem, an efficient and cost effective system solution has to be implemented.

121

Figure 1. Types of Test Track

MATERIAL AND METHODS

An analysis of the numbers of driving licenses issued by the Karnataka Transport Department indicates a sharp decline. During the period Sep 2009 to Mar 2010 36,442 driving licenses were issued, whereas the department during March 2010 to September 2010 had issued only 25,796 driving licenses. It indicates that the process of issuing driving licenses has become stringent leaving less chances of indulging in both demand and supply side of corruption (Vanhere Payal Gopinath et al., 2017).

Driving license test consists of two tests namely off-road and on-road test. The driver is made to drive on off-road to examine his ability in controlling the vehicle and on-road test is conducted in light traffic on normal road (Road accidents in India, 2011; The Financial Express on the web, 2011; Mondal, et al., 2011; ShizhuangLin et al., 2013).

IDPC SYSTEM SIGNIFICANCE AND FEATURES
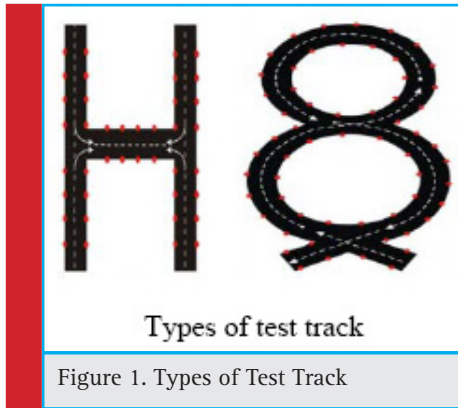
The existing driving test procedure done manually has got several limitations, which insists the need for smart driving skill testing system. The drawbacks of manual system are, multiple examiners at locations evaluate the candidate's driving on subjective assessment, which paves a lead for manipulation of entries (The Financial Express on the web, 2011). Secondly the test results are paper documented, requiring storage space. These drawbacks can be eliminated with the IDPC system presented in this paper. The IDPC system also offers several advantages like total transparency, the consistency in test process, ensures selection only on merit and also prevents untrained drivers from getting into the system. The IDPC is designed with a number of features like special tracks with sensors embedded in the track, real data transfer to central monitoring and result issuance system and on completion of the test, the results are printed and handed over to candidate immediately.

RESULTS AND DISCUSSION

The test monitoring and result display application is developed using LabVIEW software. The LabVIEW based GUI for e-application accept the test candidate's following personal details – first name, middle name, last name, address for communication, date of birth and the gender. The pop up window will inform the operator about all the incorrect information in the submitted e-application. To continue with the driving skill test process, the e-application should be submitted successfully.

The information regarding the test candidate will be recorded with the system for the generation of test result card, after which the candidate can move to the test vehicle to drive on sensor embedded H-track. During the driving on the sensor embedded H track, if the test candidate trounces any of the sensors or crosses the line of intersection between the sensors or even stop the test vehicle while the drive on the H track is progressing then the LabVIEW based GUI will display: TEST FAILED as shown in Figure 2. Now if the test candidate has suc-
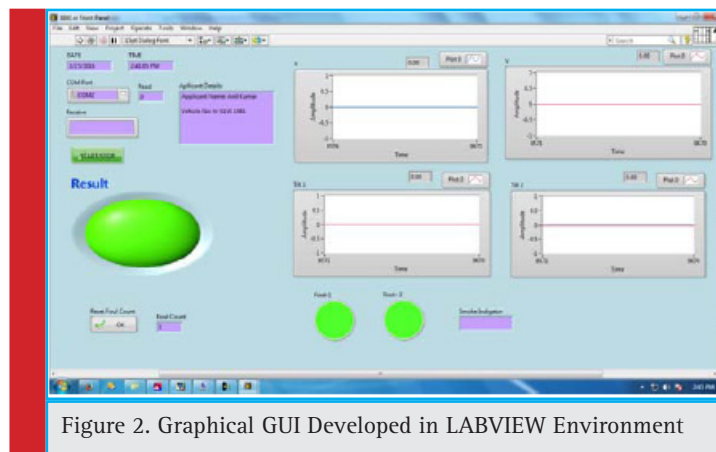

Figure 2. Graphical GUI Developed in LABVIEW Environment
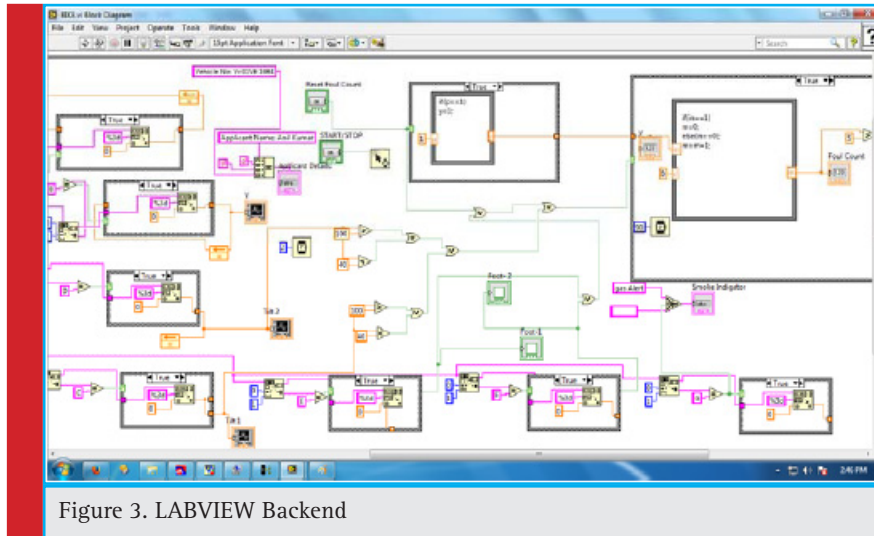
Figure 3. LABVIEW Backend

cessfully completed the drive on the sensor embedded H track, then the STOP button has to be pressed. On pressing the STOP button, then the test status will be displayed as TEST PASSED on the LabVIEW based GUI as shown in Figure 3.

CONCLUSION

Intelligent Driving Permit Card (IDPC) system using local Wireless Sensor Networks (LWSN) acquisition is discussed. The usage of LabVIEW based technology for driver assessment in the automated driving test process eliminates human intervention leaving no scope for manipulation and negotiation. Based on the test results, IDPC system increases the level of transparency in the driving skill test process and decreases the rate of corruption in the process of issuing the driving license.

REFERENCES

Marianne Bertrand, Simeon Djankov, Remma Hanna and Sendhil Mullainathan (2007), btaining a Driver's License in India: An Experimental Approach to Studying Corruption, The Quarterly Journal of Economics 122 (4): 1639-1676.

Driver errors cause most road deaths in India,The Times of India on the web. 2010 – 07-04.

Vanhere Payal Gopinath, Pagare Sneha Sunil, Aware Rupali Shantaram, Snehal S. Somwanshi, (2017), Automatic Driving License Test with Android Application, International Journal of Innovative Research in Computer and Communication Engineering, Vol. 5, Issue 1, January.

Government of India. Ministry of Road Transport and Highways. Road accidents in India: 2009, 2011-08-23.

India suffers from highest number of road accidents: WHO". The Financial Express on the web. 2011-05-05.

Mondal, P, Abhishek Kumar, U. D. Bhangale, and Dinesh Tyagi (2011), A Silent Tsunami on IndianRoad: A Comprehensive Analysis of Epidemiological Aspects of Road Traffic Accidents, British Journal of Medicine & Medical Research: Vol. 1, No.1. pp.14-23.

Shizhuang Lin; Jingyu Liu; Yanjun Fang; Wuhan Univ., Wuhan (2007), ZigBee Based Wireless Sensor Networks and Its Applications in Industrial,IEEE International Conference on Automation and Logistics, Jinan, pp. 1979-1983.

S Mohit John and Arun Joseph (2013), Zigbee based wireless data acquisition using lab view for implementing smart driving skill evaluation system, International Journal of Instrumentation and Control Systems (IJICS), Vol. 3, No. 3, pp. 56-63.

BBRC
Bioscience Biotechnology
Research Communications

Mitigation of Voltage sags using Grey Wolf Optimization in the grids connected Energy Resources

R. Nandini[1]*, Velappagari Sekhar[2] and K. Ramesh[3]

[1]*PG Scholar, Department of E.E.E., Kuppam Eng. College, Kuppam*
[2]*Associate Professor, Department of E.E.E., Kuppam Eng. College, Kuppam*
[3]*Professor, Department of E.E.E., Kuppam Eng. College, Kuppam*

ABSTRACT

The tremendously giant scale mix of Low Voltage (LV) Distributed Energy Resources (DER) at the distribution network offers early open doors for the enhancement of power quality and system reliability. As of now, the event of sizably voluminous perturbances at the transmission organize causing astringent voltage sags at the dispersion level could prompt the separation of a sizably voluminous segment of DER units associated with the LV network, causing an increasingly thorough perturbance. In this article, Low-Voltage Ride Through (LVRT) necessities and current help procedures are proposed to relieve the effect of astringent voltage list at the conveyance level for DER systems associated with LV arrange. The effect of embracing the planned LVRT techniques will be dissected through reproduction. A created in house ESS model consolidating the created LVRT techniques is furthermore exhibited, and its ability to consent to the projected LVRT imperatives is shown using MATLAB/SIMULINK condition.

INTRODUCTION

The cosmically huge scale reconciliation of DER predicated on Renewable Energy Sources (RES) in distribution and transmission systems has driven system directors to characterize Low Voltage Ride Through (LVRT) needs, therefore on shun the sudden loss of an important live of power generation from RES and provides some voltage bolster amid astringent perturbances. The increased regulation predicated on photovoltaic (PV) associated for the foremost shared to distribution systems, has driven a number of nations to stretch LVRT necessities

from transmission to MV distribution systems (Yang and Enjeti 2015). However, future combination of PV and alternative Distributed Energy Resources (DER), as an example, Energy Storage Systems (ESS) are projected to be related to cardinal systems (Rodríguez 2011).

Taking into consideration that no cardinality talents area unit needed for the LV networks, a foremost live of power regulation will be disoriented if an intensive faults happens at the High Voltage (HV) distribution or transmission systems. The combination of distributed ESS for the causation of self-utilization plans may gain advantage amendment management quality and system dependableness misusing the ability of its capability device interfaces. Functionalities, as an example, voltage sag alleviation, LVRT, harmonics remission, flicker compensation, among others, area unit all around archived within the literature (Díaz-González 2016).

This paper is concerned the benefits of receiving cardinal LVRT capacities for DER units related to the cardinal distribution grid therefore on enhance voltage profiles within the LV lattices amid astringent deficiencies happening at the high voltage levels. Such voltage contour improvement is relied upon to decrease the disengagement danger of different DER units related to the cardinal network attributable to least voltage aegis. To achieve LVRT back to back converter should coordinate each other, which is achieved with Some of the necessary population-based metaheuristic algorithmic programs are genetic algorithm (GA), gravitated search algorithmic program (GSA) (Garg 2019).

Ant colony optimisation (ACO), harmony search algorithmic program (HS, and particle swarm optimisation (PSO) (Guerrero 2013) are used. However gray Wolf algorithmic program (GWA) may be a novel population-based metaheuristic algorithmic program, which is planned by (Abdullah 2018).

It mimics the social leadership and searching behaviour of grey wolves. it's many benefits over the prevailing metaheuristic algorithms like (Mirjalili et al., 2016): 1) it's straightforward to implement, 2) It will maintain the data regarding the search house and keeps the simplest answer obtained, 3) it's fewer parameters for fine standardisation, and 4) it's a derivative free algorithmic program (Rodrigues and Lopes 2018).

Because of these properties, the performance of GWA is best than existing population-based metaheuristic techniques.

MATERIAL AND METHODS

Low Voltage Ride Through

The examination of a grid associated power network in unequal network voltage conditions should be possible

by disintegrating the grid voltage in its balanced segments. The less complex approach to control the present vector when faced with disturbed voltage conditions is to control the two synchronous reference frames characterized by the positive-and negative-succession vectors, turning at the principal recurrence in inverse directions. The LVRT methodologies follow up on the information active and receptive power set-focuses. The connection between the dynamic and receptive power set-focuses and the quick dynamic and responsive powers under unequal voltage circumstances is given by,

$$P = P_0 + P_c \cos(2\omega t) + P_s \sin(2\omega t)$$
$$Q = Q_0 + Q_c \cos(2\omega t) + Q_s \sin(2\omega t)$$

(1)

Where P_0 and Q_0 are the normal estimations of the quick active and receptive power, while Pc, Ps, Qc and Qs characterizes the size of the oscillatory terms of the active and responsive power, separately, that emerge from disturbed grid voltages, Q_0, Ps and Pc are given by (2) (R. Teodorescu et al., P. Rodr'ıguez et al.).

$$\begin{bmatrix} P_0 \\ Q_0 \\ P_S \\ P_C \end{bmatrix} = \frac{3}{2} \begin{bmatrix} V_d^+ & V_q^+ & V_d^- & V_q^- \\ V_q^+ & -V_d^+ & V_q^- & -V_d^+ \\ V_q^- & -V_d^- & V_q^+ & V_d^+ \\ V_d^- & V_q^- & V_d^+ & V_q^+ \end{bmatrix} \begin{bmatrix} I_d^+ \\ I_q^+ \\ I_q^- \\ I_d^- \end{bmatrix}$$

(2)

Where the positive and negative sequence of both quadrature and direct current components are given by (3), (4) and (5)

$$I_{dq}^+ = \begin{bmatrix} I_d^+ \\ I_q^+ \end{bmatrix} + I_d^- \begin{bmatrix} \cos(2wt) \\ -\sin(2wt) \end{bmatrix} + I_q^- \begin{bmatrix} \sin(2wt) \\ \cos\{2wt\} \end{bmatrix}$$

(3)

$$I_{dq}^- = \begin{bmatrix} I_d^- \\ I_q^- \end{bmatrix} + I_d^+ \begin{bmatrix} \cos(2wt) \\ -\sin(2wt) \end{bmatrix} + I_q^+ \begin{bmatrix} -\sin(2wt) \\ \cos\{2wt\} \end{bmatrix}$$

(4)

$$I_d^+ = I^+ \cos\delta^+ \qquad I_d^- = I^- \cos\delta^-$$
$$I_q^+ = I^+ \sin\delta^+ \qquad I_q^- = I^- \sin\delta^-$$

(5)

The terms P_{ref} and Q_{ref} are reactive and reactive power set-point respectively, accordingly (6) [6], [8].

$$P_0 = P_{ref} \qquad P_s = 0$$
$$Q_0 = Q_{ref} \qquad P_c = 0$$

(6)

It should be seen that once the device is related to associate unequal AC supply, the swaying terms of the active power are not zero. Therefore on eliminate the dynamic power wavering beneath these conditions it's projected to characterize the Active Power oscillating terms annotation and computer love zero. the current set up permits the that means of the current set-focuses so the dynamic power wavering at double the key return is completely disposed of and also the DC a part of the responsive power finish up invalid. Regardless, this management

technique exhibits many hindrances, as an example, the enlargement within the heap current within the imperfect stage and a crucial receptive power wavering.

In request to abstain from surpassing the instrumentation current confinements, the dynamic and responsive power ar forced with the goal that the next current references do not surpass a pre-decided esteem. This impediment is especially essential amid a blame circumstance, because the current of the defective stage can increment attributable to the explosive voltage list.

Grey Wolf Optimization

Grey wolf advancement is a swarm clever system created ,which copies the initiative chain of command of wolves are notable for their gathering chasing. Grey wolf has a place with Canidae family and for the most part like to live in a pack. They have a strict social overwhelming pecking order; the pioneer is a male or female, called Alpha.

The alpha is generally in charge of basic leadership. The requests of the predominant wolf ought to be trailed by the pack. The Betas are subordinate wolves which help the alpha in basic leadership. The beta is a counsel to alpha and discipliner for the pack. The lower positioning dark wolf is Omega which needs to present all other prevailing wolves. On the off chance that a wolf is neither an alpha or beta nor omega, is called delta. Delta wolves command omega and reports to alpha and beta.

The chasing strategies and the social progressive system of wolves are numerically demonstrated so as to create GWO and perform improvement. The GWO calculation is tried with the standard test works that show that it has unrivalled investigation and abuse qualities than other swarm knowledge procedures. Further, the GWO has been effectively connected for taking care of different designing advancement issues Moreover, a large portion of the swarm canny procedures that are utilized to take care of the enhancement issues can't have the pioneer to power over the whole time frame. This downside is corrected in GWO in which the Grey wolves have characteristic administration instrument. Further, this calculation has a couple of parameters just and simple to execute, which makes it predominant than prior ones. Because of the flexible properties of the GWO calculation, endeavours have been made to execute GWO to tackle the streamlining issues.

Review of Grey Wolf Optimization Algorithm the GWO copies the chasing conduct and the social chain of command of dark wolves. Notwithstanding the social chain of command of dark wolves, pack chasing is another engaging societal activity of Grey wolves. The primary sections of GWO are circling, chasing and assaulting the prey. The algorithmic strides of GWO are exhibited in this segment. Algorithmic advances and Pseudo code

The GWO calculation is depicted quickly with the following steps:

Stage 1: instate the GWO parameters, for example, seek agnts(Gs) plan variable size (Gd),vectors an, A,C and most extreme number of emphasis

$$\vec{A}. = 2 \vec{a}.rand_1 - \vec{a}$$
$$\vec{B} = 2.rand_2 \tag{7}$$

The values of $\vec{a}$ are linearly descresed from 2 to 0 over the courseof iterations

Stage 2: Generate wolves haphazardly dependent on size off the pack. Numerically, these wolves can be communicated as,

$$Wolves = \begin{bmatrix} G_1^1 & G_2^1 & . & . & G_{GD}^1 \\ G_1^2 & G_2^2 & . & . & G_{GD}^2 \\ . & . & & . & . \\ . & . & & . & . \\ G_1^{GS} & G_2^{GS} & . & . & G_{GD}^{GS} \end{bmatrix} \tag{8}$$

Stage 3: Estimate the fitness estimation of each chase specialist

Stage 4 : Identify the best chase specialist (G), the second best chase operator (G) and the third best chase operator (G)

Stage 5: Renew the area of the present chase operator

Stage 6 : Estimate the wellness estimation everything being equal.

Stage 7 : Update the estimation of G,G and G

Step 8 : Check for stopping condition i.e., whether the Iteration reaches Itermax, if yes, print the best value of solution otherwise go to step 5. [11-13]

RESULTS AND DISCUSSION

So as to approve the consistency of the proposed network with the LVRT requirement, was imitated utilizing MATLAB SIMULINK. A three-stage adjusted voltage dip was tested considering the most extreme dynamic current technique proposed. Prior to the unsettling influence, the ESS unit was injecting $3*10^7$ and reduce this to $2*10^7$ during ubnormal condition. The highest current that the ESS could give was intentionally constrained to 16A, in like manner to the appraised power of 11kv grid rating.The acquired outcomes for voltage and current and power are appeared in Figure 2.

As it can be observed from fig. 1, the ESS can stay associated for the voltage curve imitated and gives the most extreme current when the voltage achieves its base. Because of the voltage situations, it was unrealistic
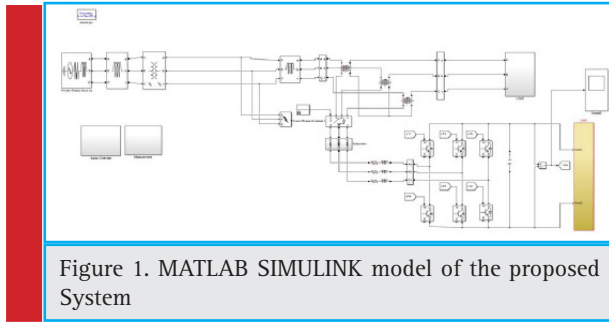
Figure 1. MATLAB SIMULINK model of the proposed System

to safeguard the pre fault dynamic power set point, since the present furthest reaches of the ESS are achieved first. As the voltage builds, the power yield additionally begins to recuperate to the pre-blame set-point. At the point when the dynamic power recuperates its pre-blame esteem, the present begins to diminish so as to protect the dynamic power yield steady, of course since Pconst remuneration technique was in power.

As it can be observed in Fig. 2, the ESS can stay associated for the voltage curvature imitated and gives the most extreme current when the voltage achieves its base. Because of the voltage wave disorders, it was unrealistic to safeguard the pre fault dynamic power set-point since the present furthest reaches of the ESS where achieved first. As the voltage builds, the power yield additionally begins to recuperate to the pre-blame set-point. At the point when the dynamic power recuperates its pre-blame esteem, the present begins to diminish so as to protect the dynamic power yield steady, of course since Pconst remuneration technique was in power.

CONCLUSION

This paper assesses the effect of receiving LVRT essentials using Grey wolf optimization for the DER associated at the LV networks. The advantage of considering LVRT necessities for PV and ESS was asse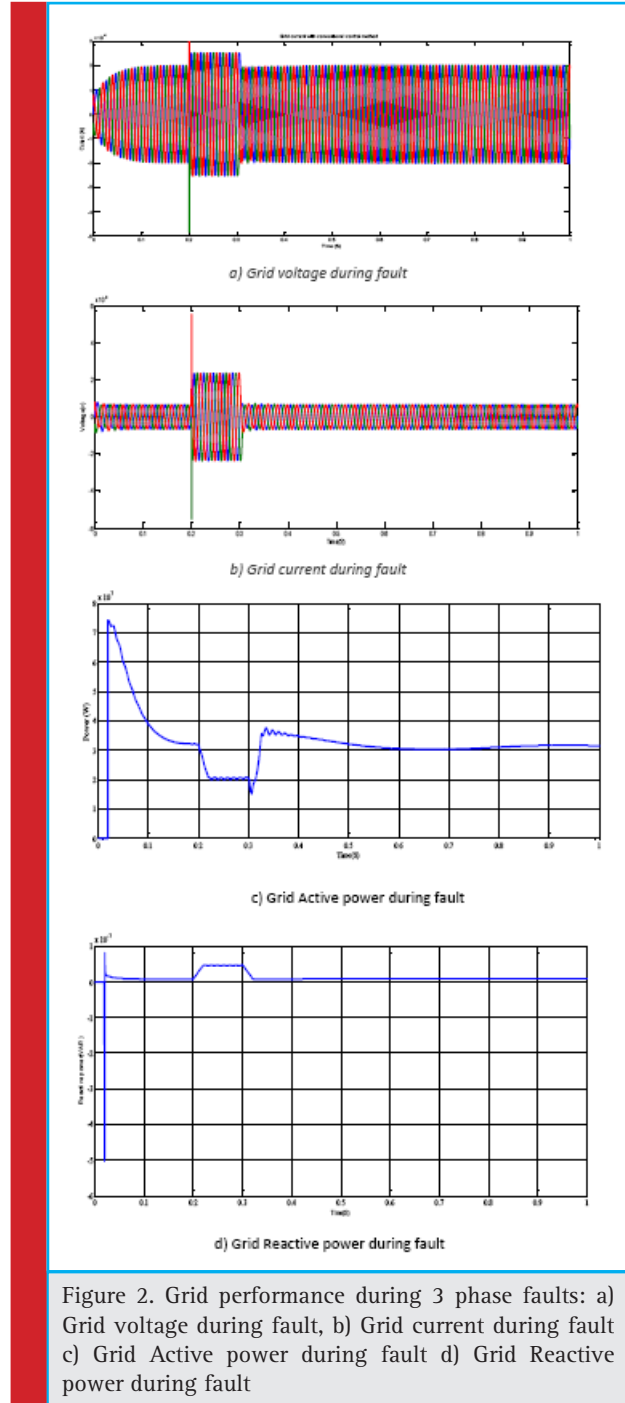ssed, considering the procedures assigned. The outcomes got exhibit that dynamic current help is more effectual than responsive current help, thinking about the resistive idea of feeders. Just for R/X proportion proximate to one, which are unconventional at this voltage condition, the current reactive components help gives a remote advantage. A solid technique predicated on the dynamic power bolster was actualized in an in-house created ESS model, for matlab/simulink approval. The outcomes demonstrate that the GWO bolstered inverter can agree to the LVRT characterized and give the present help as needs be. Considering the normal increment of DER assets associated at the conveyance framework, completely in LV systems, the selection of the LVRT techniques proposed in this paper could shun the synchronous disengagement of a weighty measure of puissance age and capacity limit,

Figure 2. Grid performance during 3 phase faults: a) Grid voltage during fault, b) Grid current during fault c) Grid Active power during fault d) Grid Reactive power during fault

because of flaws happening at the transmission level. This will benefit change the strength of the framework.

REFERENCES

Abdullah M.Shaheen (2018), A review of meta-heuristic algorithms for reactive power planning problem, Ain Shams Engineering Journal Volume 9, Issue 2, Pages 215-231.

F.D´ıaz-Gonz´alez (2016), "Short-term energy storage for power quality improvement in weak mv grids with distributed renew-

able generation, in PES Innovative Smart Grid Technologies Conference Europe (ISGTEurope), pp. 1–6.

Harish Garg (2019), A hybrid GSA-GA algorithm for constrained optimization problems , Information Sciences, 499–523.

J. M. Guerrero (2013), Advanced control architectures for intelligent microgrids part ii: Power quality, energy storage, and ac/dc microgrids, IEEE Transactions on Industrial Electronics, vol. 60, no. 4, pp. 1263–1270.

J. Rodrigues, A. Lopes (2018), The Role of Low-Voltage-Ride-Through Capability of Distributed Energy Resources for the Mitigation of Voltage Sags in Low Voltage Distribution Grid , Power Systems Computation Conference.

Mirjalili S., Mirjalili M., Lewis A (2016), Grey Wolf Optimizer. Advances in Engineering Software, vol 69, 46-61.

Omkar Kulkarni, Shalaka Kulkarni (2018), Process Parameter Optimization in WEDM by Grey Wolf Optimizer", Materials Today: Proceedings.

P. Rodr´ıguez (2011), Multiresonant frequency-locked loop for grid synchronization of power converters under distorted grid conditions , IEEE Transactions on Industrial Electronics, vol. 58, no. 1, pp. 127–138.

R. Teodorescu, M. Liserre, and P. Rodriguez (2019), Grid converters for photovoltaic and wind power systems. John Wiley & Sons, vol. 29.

Y. Yang, P. Enjeti (2015),Wide-scale adoption of photovoltaic energy: Grid code modifications are explored in the distribution grid, IEEE Industry Applications Magazine, vol. 21, no. 5, pp. 21–31.

BBRC
Bioscience Biotechnology
Research Communications

Performance Analysis of Reward Based Learning Technique Cooperative Spectrum Sensing (RL-CSS) in Cognitive Radio Networks

P. Sakthibalan, M. Selvakumar, M. Saravanan and K. Devarajan*

Department of Electronics and Communication Engineering, Annamalai University, Chidambaram, Tamilnadu, India

ABSTRACT

Spectrum allocation for secondary users (SUs) is a prominent task for improving communication and optimal channel utilization in cognitive radio networks (CRNs). Due to autonomous nature of CRNs, spectrum counterfeits in data sensing is a common threat experienced by the secondary users. In this manuscript, a reward based learning (RL) is presented for mitigating the influence of data falsification in cooperative spectrum sensing (CSS) process. The legitimate secondary users exploit the neighboring information to access and process data within the allocated spectrum. The decision of the fusion center (FC) helps to improve the reliability of other secondary users by sequentially evaluating the reward of the SUs based on detection probability. The process of SU reward estimation is based on the previous communication factors with the consideration of variance and normalization errors at the time of channel detection. The two different process of channel detection rate and reward assignment improves the rate of detection with a controlled delay. Experimental results verify the consistency of the proposed RL-CSS method by improving network throughput and detection rate and minimizing detection delay and channel disconnection ratio.

KEY WORDS: COOPERATIVE SPECTRUM SENSING, DATA FALSIFICATION ATTACK, FUSION CENTER DECISION MAKING, Q-LEARNING, REWARD BASED CHANNEL SELECTION

129

INTRODUCTION

Cognitive radio (CR) is advancement in communication technology for addressing spectrum allocation and scarcity problems among secondary and primary users. Resolving the pertaining issues in sharing and allocation improves the spectrum utilization rate of the communicating devices. CRs permit secondary users (SUs) to share the primary user (PU) spectrum without interfering PU communications. The un-licensed SUs utilize the licensed frequency of the PU for performing its communication, (Li et al. 2015; Zhang et al. 2015).

SUs identify the unused or free spectrum through sensing process as an initiative for communication. Spectrum sensing being the prime requirement, the SUs must be careful in mitigating the influence of overhearing, shadowing and fading to prevent communication loss. Cooperative spectrum sensing (CSS) minimizes the impact of the fore-said factors in communication by employing different centralized and de-centralized decision making systems along with fusion ideas. With a cooperative sensing nature, CR improves the bandwidth utilization of the secondary users (Zou et al. 2011). CSS aided cognitive radio systems are exposed to the risk of data falsification attacks as the physical layer provides open access to other SUs. Besides, the protocol stack of CR nodes does not hold a strong security measure to initially detect and evade malicious activities of the SUs (Zhang et al. 2018).

The large-scale CR applications demand a high-security for communication for which data falsifying SU mitigation is necessary. The malicious SUs launching falsification attacks are characterized by the interruptions and decreasing access in PU services (Fadlullah et al. 2013). The adverse effects of the SU attacks are foreseen with the observations of false alarm and misdetection probability. Legitimate SUs share spectrum sensing information with the neighbors to prevent interruptions in the allocated frequency spectrum. Due to the lack of knowledge of the behavior of the neighbors, the chances of legitimate SU information being handled by an illegitimate user is high.

Therefore, the adversary influences the communication between legitimate users by interruptions, overhearing, false data injection and loss. Conventional attack mitigation systems are incorporated with a decision making process that analyzes the communication data to prevent network performance degradation (Qian et al. 2013; Qian, et al. 2014).

CR networks are autonomous and flexible such that both PU and SU are exposed to threats that results in unexpected network performance errors. In a data falsification attack, the SU sensed information is falsified by the malicious user present in the network. As the malicious user is also a SU, detecting and mitigating the threat is a challenging task in CR communications. Cooperative Spectrum Sensing (CSS) is commonly adopted by the SUs to effectively utilize the available spectrum. Data falsification attack imposed on the CSS process, results in massive communication dropouts and spectrum degradation. The recent research concentrates in mitigating data falsification attack in CSS due to the presence of malicious users (Zeng et al. 2014; Althunibat et al. 2016).

The feedback based trust mechanism to mitigate collusive false feedback attacks in CR networks. The fusion center decides in accepting or rejecting the CSS request of SU by assessing its trust value (Feng, J. et al. 2018). The attackers are differentiated by analyzing the feedback and historical data at the time of sensing. This trust mechanism controls malicious response and malicious success rate. A data falsification attack detection scheme for minimizing errors in CR spectrum sensing process has introduced (Chen et al. 2017).

The detection scheme observes the behavior of the secondary users with the fusion center to nullify the effect of attackers. This probabilistic cooperative sensing scheme (P-CSS) method incorporates linear combination rule to decide upon the detected attackers. A security aware resource allocation method is designed for cognitive radio networks (CRNs) employing non-orthogonal multiple access (Xu et al. 2018).

This resource allocation method is intended to improve power conservation, user concentration and minimize delay in SU communication. The security method accounts the channel state information (CSI) and queue state information (QSI) of the link layer to improve secrecy throughput.

Cao et al. (2018) proposed two secrecy schemes for improving SU communication rates retaining PU secrecy rate in CRN. First scheme is a joint optimization for SU sum rate with PU secrecy rate satisfaction. The second scheme is a frequency streamlining method to minimize interference in CR communications. The joint approach mitigates the threat of eaves dropping attack by improving sum and transmission rates of SU and secrecy rate of PU. A design of secure beam forming technique for detecting illegitimate SUs in multiple-input single-output CRNs is proposed in (Zhang et al. 2018).

The design of secure beam forming technique is extended for overlay and cooperative transmission schemes of the SUs. In both the transmissions schemes, the secrecy of the PUs is retained in primary and self-communications of the SUs. Low-rank matrix completion security framework is designed (Qin et al. 2018) for improving the performance of CSS networks. This framework detects tainted channels and employs a ranking algorithm to identify legitimate users. The numeri-

cal analysis of the framework proves its consistency by improving attack detection precision and minimizing data gathering cost.

Different from the above methods, the authors (Khalunezhad et al. 2018) proposed a secure multi-hop CSS method for resolving the issues of data falsification attacks. The authors have addressed the security issues caused by the forwarding SUs. This security method considers the sensing and forwarding multi-path trust (TBM) of the SUs to estimate the legitimacy of the users. This method holds a better trust value for SU selection over random and falsification attacks.

A trust based CSS is designed by (Wang et al. 2018) for CRNs to improve the communication success rate. This method is crucial in differentiating the errors in sensing and low sensing SUs to improve the detection precision. This method acquires the authentic sensing report of the users to make decisions on attack detection.

The (Wang et al. 2010) proposed an illegitimate SU detection method in CRN for improving the security level of CR communications. The proposed detection method is successful in mitigating compromised attacks by analyzing the sensing reports of the users. The advantageous factor of is that the sensing histories of the SU are analyzed for each of the instigating communication process.

Anomaly based detection (ABD) is proposed in (Jararweh et al. 2018) for detecting intrusion in cognitive radio networks. ABD is an intrusion detection system that performs monitoring, feature classification and condition processing for identifying malicious SUs. This detection method improves detection rate minimizing false negative and false positive probabilities. A cooperative attack detection scheme (CADS) for improving common control channel communications is proposed in (Zou et al. 2016).

This scheme gains knowledge of the available channel list of the SUs to estimate the reputation of the SUs. The cooperative behavior of the SUs and reputation threshold aids identification of the malicious SUs. A cluster based penalty mechanism is proposed in (Li et al. 2014) to improve the security of CR communications. The cluster heads and fusion centers are responsible for estimating and managing the trust of the CR users. The FC discards the illegitimate users by deteriorating their trust value. This ensures successful transmission rates with most appropriate trust values.

A multi-antenna target based eavesdropping attack detection scheme is proposed (Kang et al. 2015) for ensuring secure PU and SU communications in CRN. The proposed detection scheme is designed to improve the secrecy rates if the PU by assigning rewards for the SU. The SUs with higher rewards are eligible for communication, improving power conservation and security aspects in communication.

MATERIAL AND METHODS

A. Reward Based Learning for Cooperative Spectrum Sensing (RL–CSS)

Network model

The figure 1. illustrates the network model of the proposed system. We model the network as an undirected graph G with N number of secondary users (SUs). The SUs are connected though wireless channels M to the base station (BS) or access points (APs) that serve as the primary user (PU). The SU communication is modeled to be unified at the fusion center (FC) that supports user-to-user communication. In the M channels, the SUs are allocated with s slots for communication. The slots are active until the licensed spectrum is allocated to the SUs. If the SUs are idle, then the slots are freed. The channels are adaptive, accepting any user at any instance of time.
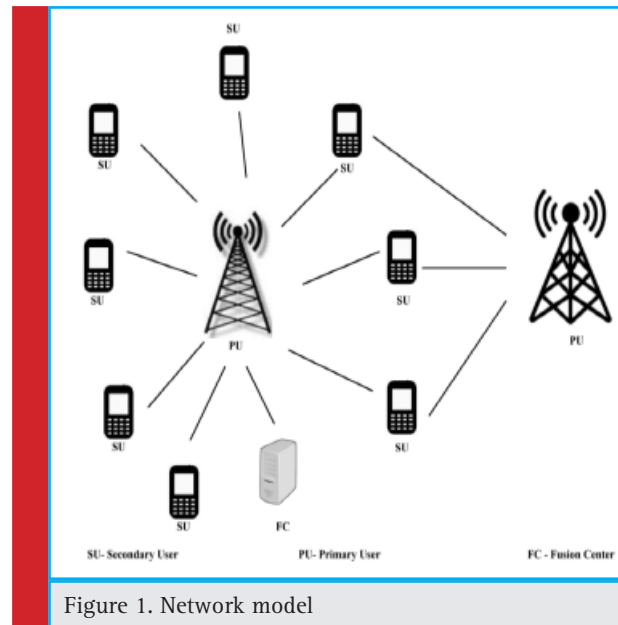
Figure 1. Network model

Adversary model

In our work, we consider a data falsification attack. The malicious users inject forged sensing information in the communication channel. This attack attracts the entire traffic in a channel and results in resource unavailability problems and thereby the transmission rate of the legitimate SU's is degraded. A model of the falsification attack is represented in Figure 2.

Methodology

In this learning method, the channel state information (CSI) of a CR node is assessed for determining its reliability. Similar to the conventional analysis, received

Figure 2. Data falsification attack model
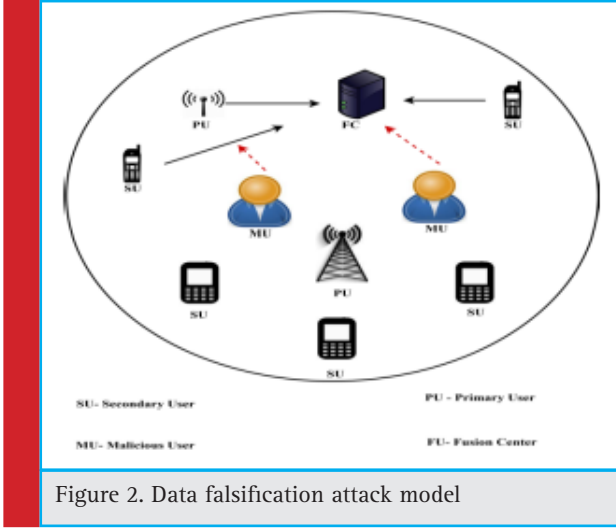
signal power (p_r) is estimated at the initial stage. Equation (1) represents the measurement of p_r

$$p_r = \frac{p_t\, G_t\, G_r\, h_t^2\, h_r^2}{d^2 L} \qquad (1)$$

Where, p_t is the power for transmission, G_t and G_r are the antenna gain of the transmitter and receiver, h_t and h_r are the transmitter and receiver height, L is the transmitter and loss factor and is the distance between the transmitter $\varnothing_t$ in a time slot s from SU. The transmitter and receiver mentioned here represent the *SU - SU or SU - FC (or) SU - PU* pair. The rate of interference observed in a channel $m \in M$ is computed as in equation (2)

$$p_{r-int} = \begin{cases} 0,\ If\ d_{min}\ \leq d \\ 0, if\ d_{min}\ and\ d_{max} > d \\ x, otherwise \end{cases} \qquad (2)$$

Where x is the state where no observation is made and hence it requires further sensing, d_{min} and d_{max} are the minimum and maximum distance of coverage.

Let σ_c represent the decision of a FC to accept a chunk received at s, then

$$\sigma_c = \begin{cases} accept, if\ p_{r-int} = 0 \\ discard, if\ p_{r-int} = 1 \\ other, if\ p_{r-int} = X \end{cases} \qquad (3)$$

Q- Learning process is introduced to verify the σ_c of the FC as per equation (3). The learning process generates a reward by estimating the σ_c imposed by a FC on a SU. This estimation requires the threshold p_r for each slot s, the threshold $pr(p_{r-th})$ is estimated as

$$p_{r-th} = \frac{\sum p_r}{(i+1) + (1+2) + \cdots (i+n)}, i = (s-2) \in s$$

$$p_{r-th} = \frac{\sum p_r}{\sum(i+n)} \qquad (4)$$

The error variance (∇_e) in two time slots i *and* ($i+1$) is s is this estimated as

$$\nabla_e = |p_r(i) - p_r(i+1)| \qquad (5)$$

The error variance in received power b is less than p_{r-th} in all s. In this case, the learning process decides on either of σ_c by analyzing the normalization error (n_e) for each chunk c. The normalization error occurs due to change in phase or position shift of the SU, obstacle interference or path loss. If is then estimated using equation (6)

$$n_e = \prod_{j=1}^{c} \left(\frac{p_r(j)|C_i=1}{p_r(j)|C_i=0} \right) \qquad (6)$$

The learning process gets $\nabla_e, n_e,\ p_{r-int}$ and p_d as analysis input and performs the decision making by assigning reward Q. For the above input, there are two cases that are to be analyzed. The analysis depends on the interference observed in the communicating channel.

Case 1: Interference in p_r is 0

Analysis 1: Let the p_{r-int} be 0 for s communication. In this case the SU is located within the range of the transmitter and $d_{min} \leq$ d, d_{max} is not necessary. Therefore, from (1), $p_r \propto \frac{1}{d}$ as the loss factor and antenna gain are constant. Therefore, for a fixed d, the p_r remains the same with constant neighbors. The reward of the learning process for σ_c is estimated as

$$Q(\sigma_c) = Q(\rho_d, \nabla_e) + \omega\, (\, q_i(\rho_d, \nabla_e) - Q(\rho_d, \nabla_e)] \qquad (7)$$

Where ω is the rate of learning and q_i is the instantaneous reward. $q_i = 1$ If $n_e = 0$ and $\nabla_e \neq 0$. Therefore from (4) the decision status is represented as in Figure 3. (a)

The reward for SU whose chunk is accepted by the FC is now set as high. The and of the SU is assessed for all the communication slots. Based on the, the is sequentially selected for further relaying process and its chunks are accepted by the FC.

Case 2: Interference in $p_r \neq 0$.

Analysis 2: If either d_{min} or $d_{max} >$ d, or then the information chunk transmitted to the FC needs intense verification. Unlike the previous case, the loss factor L is not a constant in this scenario. Therefore the distance impacts the loss in c, requiring n_e estimation. The reward henceforth is estimated using equation (8)

$$Q(\sigma_c) = Q((p_d - 1), \nabla_e, n_e) + \omega\, [q_i((p_d - 1), \nabla_e, n_e) - Q((p_d - 1), \nabla_e, n_e)] \qquad (8)$$

The reward varies with the previous consideration of p_d, the initial p_d of an SU is assumed as 1 for $C_i = 1$. For (s −1) slots, the average $p_d = \frac{\sum p_d}{(s-1)}$ with n_e estimation. There are two condition demanding the accept or discard decision is an SU.

Figure 3. (a) Learning process decision. (b) $\nabla_e = n_e$ decision. (c) $\nabla_e = n_e$ decisions
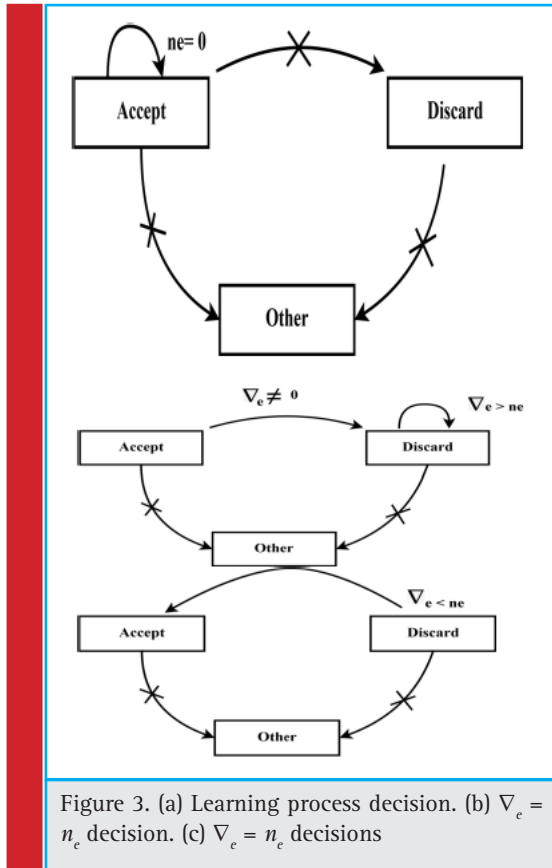
Condition 1: $\nabla_e > n_e$

Result 1: In this case, the p_d of a SU decreases for the following slots and hence, the false alarm probability (ρ_{fa}) is estimated for that SU as

$$\rho_{fa} = \rho\ (p_{r-int}|C_i = 1) \tag{9}$$

If $\rho_{fa} > p_d$ in any of the, then the SU is discarded by the FC. The learning decision is illustrated as

Condition 2: $\nabla_e > n_e$

Result 2: The normalized error is higher than the observed variance error. For the time sots $(s - 1)$ if the condition is true, $\rho_{fa} > p_d$ irrespective of d_{min} or d_{max}. The broadcast is initiated through the available neighbors with higher p_d and hence retaining accepts decision is not possible throughout $(s - 1)$ slots (Figure 3. (c)).Post the learning process with the analysis of the above said conditions, the illegitimate users, and the so called malicious users are distinguished from the condition 1 of case 2 (Figure3. (b)). The detection rate, normalization and variant errors are identified for each of the "accept" decision of equation (4) to determine the reward of SU over each communication. This update is held until $\nabla_e > n_e$ that is the selection condition for a SU to participate in communication.

RESULTS AND DISCUSSION

The proposed RL-CSS performance is assessed through simulations in MATLAB simulator. In our scenario, we have set 250SUs covering a region of 1500 x 1500m². The operational frequency of the PU is set as 4.5MHz that has a coverage distance of 120m. The performance of the proposed RL-CSS is analyzed using a comparative analysis with the existing CADS, P-CSS and TBM-CSS for the metrics: detection probability, average detection delay, channel disconnectivity and network throughput.

Detection Probability Analysis

Figure 4. illustrates the comparative analysis of detection probability between the existing and proposed RL-CSS methods. In the proposed RL-CSS, detection of false alarms is instigated when $\nabla_e > n_e$. The variations in slots of sensed information transmission, the slots that with lesser are accepted for communication, contrarily ifis less, then the SU is discarded to prevent falsifying data in the accepted channel. The broadcast is forwarded to the other neighbors neglecting the previous communication channels. The decision of the FC relies on the SU with higher reward and; the variation in received power must not be less than the threshold. These constructive features aids the proposed RL-CSS to improve detection probability by 10%, 8% and 4% compared to the existing CADS, P-CSS and TBM-CSS respectively.
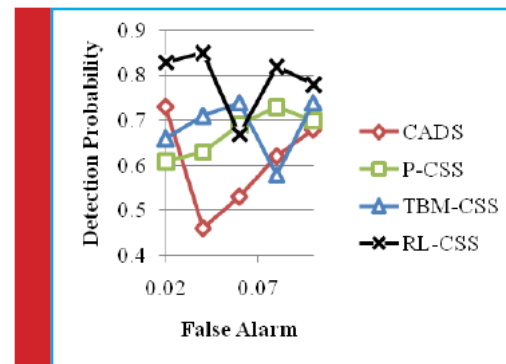
Figure 4. Detection probability

Average Detection Delay Analysis

The comparison of false alarm with average detection delay for the existing and proposed RL-CSS is illustrated in Figure 5. In the proposed RL-CSS, the relaying and transmitting SU are verified for their before selection. The selection process is instantaneous by verifying the error in received power and the false alarm probability. The other methods lag in the instantaneous process by observing the behavior and then initializing the detection process. This requires additional time in the existing methods; in the proposed reward based learning method,
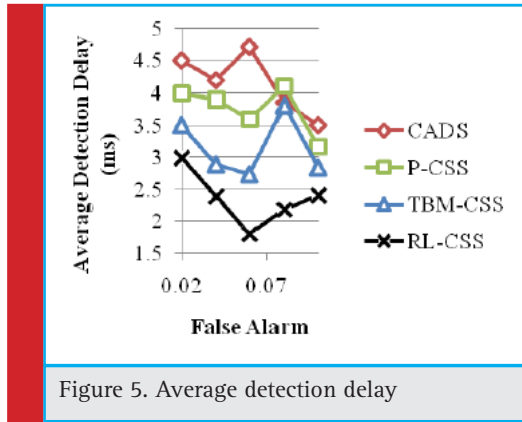
Figure 5. Average detection delay

Figure 7. Network throughput

the previous states of the SUs are retained for further analysis. Therefore, a new observation set is not necessary that minimizes the observation time of the proposed RL-CSS. RL-CSS minimizes delay by 31.14%, 23.97% and 15.14% compared to CADS, P-CSS and TBM-CSS respectively.

Analysis of Channel Disconnectivity

As the rate of malicious SU increases, channel disconnection increases (Figure 6). In RL-CSS, the sensed chunks are broadcasted through a common control channel through multiple neighbors. The neighbors with higher ρ_d are selected for transmission and relaying by observing the normalization error in received power. The neighbors with false alarm when $\tau_i = 0$, are prevented from participating in the relaying process. Similarly, the neighbors gaining higher ρ_{fa} are also mitigated from transmitting or relaying sensed information. This prevents channel being allocated for the malicious SU, and avoids unnecessary disconnection. The proposed RL-CSS minimizes channel disconnection by 52.45%, 44.47% and 23.64% compared to the existing CADS, P-CSS and TBM-CSS correspondingly.
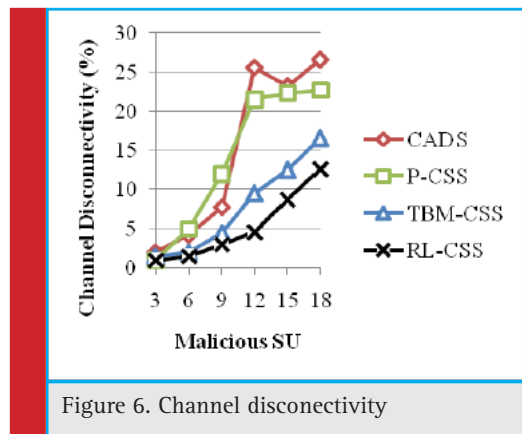

Figure 6. Channel disconectivity

Network Throughput Analysis

The comparative analysis of network throughput is illustrated in Figure 7. between the existing and proposed
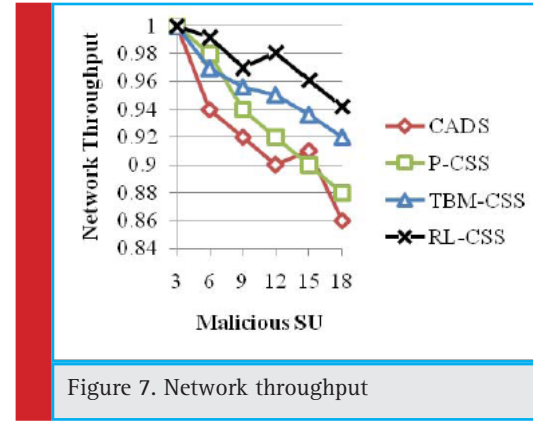
RL-CSS methods. In reward based learning method, the SU with higher channel detection rates are selected for transmitting and relaying sensed information to the FC. Based on the analysis of normalized and variance error in received power, the learning process assigns rewards to the SUs. The reward is periodically updated for the SUs throughout the time slots(s-1). In the decision making phase, the FC announces the accept state of the SU with higher ρ_d when $\tau_i = 0$. The legitimate SUs that is eligible for transmitting sensed information in all the $(s-1)$ slots in a cooperative manner, increasing network throughput. The proposed RL-CSS is found to improve network throughput by 8.2%, 6.2% and 2.2% respectively compared to CADS, P-CSS and TBM-CSS.

CONCLUSION

This manuscript introduces reward based learning for cooperative channel sensing (RL-CSS) scheme for securing legitimate SU communications. The learning process is supported by the decisions of the fusion center dependent upon the received power, channel detection probability and previous communications. The decisions are updated throughout the transmitting and relaying time slots of the SU to determine its legitimacy for participating in CR communications. The reliability of the proposed RL-CSS is verified through extensive simulation results and a comparative analysis proves the consistency of the proposed CSS scheme in CRN.

REFERENCES

Althunibat, S., Denise, B. J., & Granelli, F. (2016), Identification and punishment policies for spectrum sensing data falsification attackers using delivery-based assessment, IEEE Transactions on Vehicular Technology, Vol. 65, No. 9, pp. 7308-7321.

Cao, Y., Zhao, N., Yu, F. R., Jin, M., Chen, Y., Tang, J., & Leung, V. C. (2018), Optimization or alignment: Secure primary transmission assisted by secondary networks, IEEE Journal on Selected Areas in Communications, Vol. 36, No. 4, pp. 905-917.

Chen, H., Zhou, M., Xie, L., & Li, J. (2017), Cooperative spectrum sensing with M-ary quantized data in cognitive radio networks under SSDF attacks, IEEE Transactions on Wireless Communications, Vol.16, No. 8, pp. 5244-5257.

Fadlullah, Z. M., Nishiyama, H., Kato, N., & Fouda, M. M. (2013), Intrusion detection system (IDS) for combating attacks against cognitive radio networks. IEEE network, Vol. 27, No.3, pp. 51-56,

Feng, J., Zhang, M., Xiao, Y., & Yue, H. (2018), Securing Cooperative Spectrum Sensing Against Collusive SSDF Attack using XOR Distance Analysis in Cognitive Radio Networks. Sensors, Vol. 18, No. 2, pp 370-380..

Hlavacek, D., & Chang, J. M. (2014), A layered approach to cognitive radio network security: A survey. Computer Networks, Vol. 75, pp. 414-436.

Jararweh, Y., Salameh, H. A. B., Alturani, A., Tawalbeh, L., & Song, H. (2018), Anomaly-based framework for detecting dynamic spectrum access attacks in cognitive radio networks. Telecommunication Systems, Vol. 67, No. 2, pp. 217-229.

Jianwu, L. I., Zebing, F., Zhiyong, F., & Ping, Z. (2015), A survey of security issues in cognitive radio networks. China Communications, Vol. 12, No. 3, pp. 132-150.

Kang, T., & Guo, L. (2015), Physical layer security in cognitive radio based self-organization network. Mobile Networks and Applications, Vol. 20, No. 4, pp. 459-465.

Khalunezhad, A., Moghim, N., & Ghahfarokhi, B.S. (2018), Trust-based multi-hop cooperative spectrum sensing in cognitive radio networks, Journal of information security and applications, Vol. 42, pp. 29-35.

Li, J., Feng, Z., Wei, Z., Feng, Z., & Zhang, P. (2014), Security management based on trust determination in cognitive radio networks, EURASIP Journal on Advances in Signal Processing, Vol. 2014, No. 4, pp. 1-12.

Qian, L., Li, X., & Wei, S. (2013), Anomaly spectrum usage detection in multihop cognitive radio networks: A cross-layer approach. Journal of Communications, Vol. 8, No. 4, pp. 259-266.

Wang, J., Chen, R., Tsai, J. J., & Wang, D. C. (2018), Trust-based mechanism design for cooperative spectrum sensing in cognitive radio networks, Computer Communications, Vol. 116, pp. 90-100.

Wang, W., Li, H., Sun, Y., & Han, Z. (2010), Securing collaborative spectrum sensing against untrustworthy secondary users in cognitive radio networks, EURASIP Journal on Advances in Signal Processing, 2010, https://doi.org/10.1155/2010/695750.

Xu, L., Nallanathan, A., Pan, X., Yang, J., & Liao, W. (2018), Security-Aware Resource Allocation with Delay Constraint for NOMA-Based Cognitive Radio Network, IEEE Transactions on Information Forensics and Security, Vol. 13, No. 2, pp. 366-376.

Zeng, K., Peng, Q., & Tang, Y. (2014), Mitigating spectrum sensing data falsification attacks in hard-decision combining cooperative spectrum sensing, Science China Information Sciences, Vol. 57, No. 4, pp. 1-9.

Zhang, L., Ding, G., Wu, Q., Zou, Y., Han, Z., & Wang, J. (2015), Byzantine attack and defense in cognitive radio networks: A survey, IEEE Communications Surveys & Tutorials, Vol. 17, No. 3, pp. 1342-1363.

Zhang, M., & Liu, Y. (2018), Secure Beamforming for Untrusted MISO Cognitive Radio Networks, IEEE Transactions on Wireless Communications, Vol. 17. No. 7, pp. 4861-4872.

Qin, Z., Gao, Y., & Plumbley, M. D. (2018), Malicious user detection based on low-rank matrix completion in wideband spectrum sensing, IEEE Transactions on Signal Processing, Vol. 66, No. 1, pp. 5-17.

Zou, Y., & Yoo, S. J. (2016), Attack detection scheme against cooperative spectrum sensing data falsification on common control channel in cognitive radio networks, Wireless Personal Communications, Vol. 88, No. 4, pp. 871-896.

Zou, Y., Yao, Y. D., & Zheng, B. (2011) A selective-relay based cooperative spectrum sensing scheme without dedicated reporting channels in cognitive radio networks, IEEE Transactions on Wireless Communications, Vol. 10, No. 4, pp. 1188-1198.

Encrypting Text Messages Using DNA Cryptographic Model

B. P. Sreeja[1]*, G. Saratha Devi[2], R. Akash Kumar[3], G. Aswin Kumar[4] and R. Jaya Suriya[5]

[1,2]Assistant Professor, Department of Information Technology, Karpagam College of Engineering, Coimbatore, TamilNadu, India

[3,4,5]Student Department of Information Technology, Karpagam College of Engineering, Coimbatore, TamilNadu, India

ABSTRACT

A Digital Information can be transferred over the communication network can be easily done by the cryptographic techniques. A Confidential data can be secured by the user with help of certain cryptographic techniques like DNA cryptographic methods. The proposed technique ensures that the transmission of digital information can be secured from the attackers so, that the confidential information or data can be safeguarded. In this paper the DNA cryptographic method has been used with a posterior delayed chaotic neural network for the Encryption and Decryption purposes. XOR operation is used for the binary sequences where the message blocks generated form chaotic neural network. The User enables a secret key for the encryption and decryption process where as only the sender and the receiver can be able to open the data whereas no other third party can be involved to change or do any miscellaneous things during transmission. The Binary Sequence is converted into ASCI value and also a permutation function is used for generating the binary sequence from delayed chaotic neural network. These cryptographic Techniques is used to ensure that the data can be transmitted into a secured manner also with higher efficiency of transmission between the sender and the receiver.

KEY WORDS: DNA CRYPTOGRAPHY, XOR OPERATION, NEURAL NETWORKS, ENCRYPTION, DECRYPTION

136

INTRODUCTION

Data Communication means sharing of data from one system to another through a communication media, a very challenge of data sharing is its security. To protect the data a technique is used which is called Cryptography. Cryptography means "secret writing" that means it converts the plain text into another format which is called cipher text. It has various conventional and modern techniques to ensure the information security in the process of message transmission and maintenance time. Cryptographic techniques help to achieve integrity, authentication, reliability etc., to the transmitted information. In this paper, proposed DNA encryption technique is to demonstrate, how an individual user can protect their data's which is shared over the communication network.

Figure 1. Encryption and Decryption
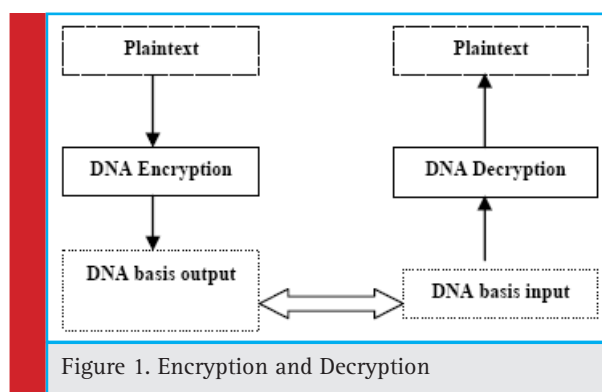
DNA cryptography is used to convert the plaintext into cipher text using DNA computational methods, for the most part of the cryptographic algorithms which occupies huge amount of memory and techniques like, One Time Pad in which there are non-repeating very large text pads, this computation method will be most useful. One gram of DNA contains 1021 DNA bases and can store 108 terabytes in the memory. A trillion bits of binary data are stored in a cubic decimeter of DNA solution. Additionally DNA based computation techniques take very less time compared with other cryptographic algorithms. The duty of every cryptography algorithm is to protect the data for long time.

In this computation technique, the bases of DNA's are arranged in randomly and the plaintext bits are stored effectively using these bases. One time pad is entirely random cryptographic computation technique. In this the data can be secured for very long duration. In adding together to memory, DNA molecules show parallel computation, which means DNA based processes are capable of deep processing. DNA chains have large scale of parallelism and its calculating speed could reach up to 1 billion times per second computations. This tech-

nique using computers consumes very less memory that is equal to one – billionth of conventional systems.

The designed encryption method of Roy et al., (2017) is using delayed chaotic neural network with a posterior DNA cryptography. To perform XOR operation with message blocks in the chaotic neural networks it required digital sequence. The transformation of the plaintext and the number of time is also based on the chaotic neural network. It is not easy for the cryptanalyst to determine the actual parameters of the encryption method

Rathi et al., (2016) proposed a method to implement data hiding using DNA sequence. In this technique both the concept of binary coding and random values are used and sample DNA sequencing is considered to encrypt the message. The receiver will get both DNA sequence and encrypted data which is then extracted to get the original message. In this method both sender and receiver will share a common DNA sequence for encryption and decryption process.

Zhang (2012) recommended the scuttle position and pixel value by using combination of chaotic systems and DNA encoding to implement encryption of digital image and using quaternary DNA encoding instead of binary encoding to enhance the efficiency of the algorithm. The encryption of secret keys is embedded in the process of encryption, so that can improve the security. Quaternary chaotic sequences control the pseudo DNA operation to increase the algorithm complexity and cipher text unpredictability.

Sreeja and Devi (2018) suggested on similar lines was that the algorithm comprised of first converting the original message into ASCII code then converted into binary form. The digital values are encoded in DNA sequences. The key selected as a DNA sequence and grouped in blocks of one byte each. A table is created based on the character position in the key.

MATERIAL AND METHODS

The Proposed algorithm is based on the chaotic neural networks with DNA Cryptography. Plaintext is accepted in any forms i.e character, numeric and special characters, after receive the input plaintext, to provide data security initially it performs encryption process. Before encryption process the plaintext (Ri) is converted into ASCII codes again the ASCII codes are converted into binary sequence with padding bits to acquire Random binary sequence generation method is followed which produces Bi = bj1, bj2 ... bjn.. At the same time key generator generates a random key which also referred as session key 'Vi'. The session key convert to ASCII code and then again the code is converted to binary sequence with padding bits for DNA cryptanalysis.
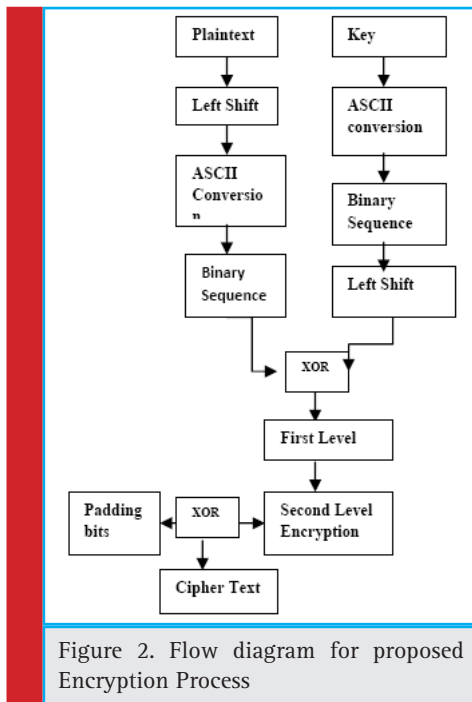
3.1 Encryption:

Plaintext is divided into block for code conversion; Each block message is fixed in length. The message block Ri is permutated with a left cyclic shift of Vi bits and message block Bj is shifted in right cyclic order by Vi bits. Then the input plaintext and the key value is perform XOR operation i.e Ri XOR Vi to get the first level of encrypted text (ciphertext Ci). Then the second level of encryption is DNA sequence, so the ciphertext Ci converted into DNA sequence by simple DNA encoding techniques four DNA strands namely A (Adenine), C (Cytosine), G (Guanine) and T (Thymine) and there are 256 combinations possible. So the key is a sequence of pairs of either 00 or 01 or 10 or 11 these pairs can be replaced by A or C or G or T accordingly the ciphertext block converted into DNA sequence 'Cj'.

Table 1. DNA Sequence	
Binary Sequence	**DNA Strands**
00	A
01	C
10	G
11	T

After refining all the message blocks the text is encrypted using proposed encryption algorithm to get DNA ciphertext.

3.2 Decryption:

The inverse of encryption is decryption process. In this process, First create the key matrix to get the normal

Figure 2. Flow diagram for proposed Encryption Process

DNA encrypted key this key used for decryption process by subtracting it from the ASCII values of the cipher text. Following, the reverse process of column and row rotation is to be performed then the transpose of that matrix is to be received. This transpose matrix gives us the original plain text.

Figure 3. Flow diagram for proposed Decryption Process

Figure 4. Create Account
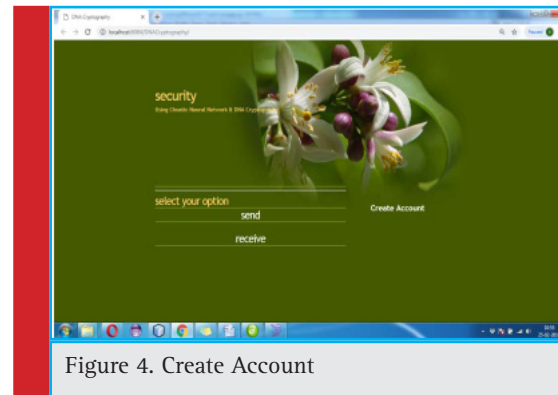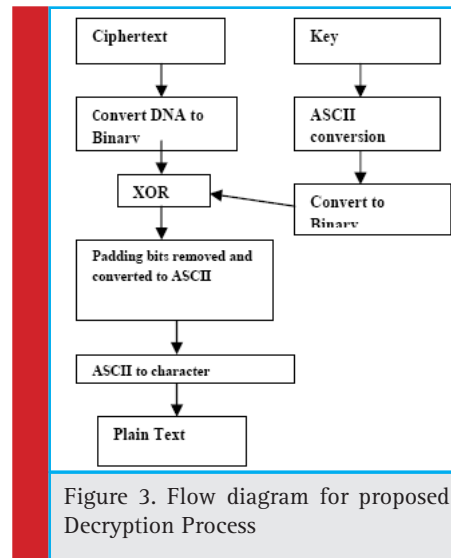
RESULTS AND DISCUSSION

The implementation results look like below GUI. This is implemented using Netbeans IDE - JAVA code. Fig 4. screenshot to choose send or to receive message also create account for new users.

Fig. 5 Screen shot to get plaintext and key value, when the data entered the plaintext converted into cipher text using DNA Cryptography

Fig. 6 Screen shot to decrypt the cipher text by entering the message ID and same key value. After encrypted the text it generate the message ID.

```
import java.io.*;
class encryptmessage
{
```
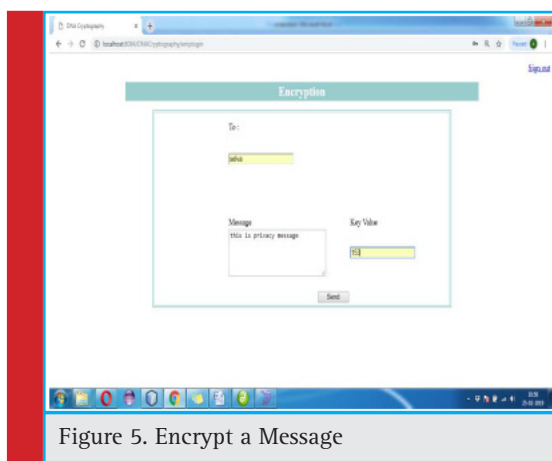
Figure 5. Encrypt a Message
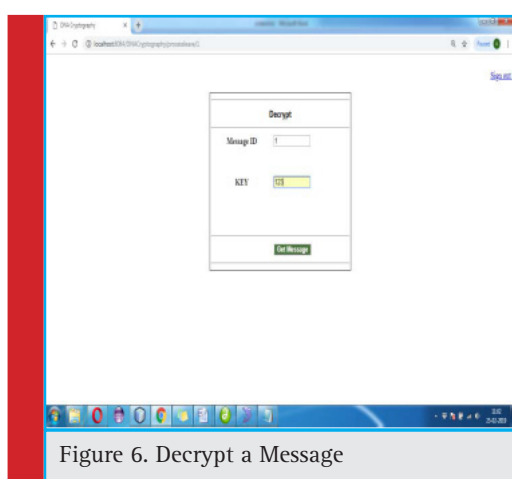
Figure 6. Decrypt a Message

```
public static void main(String args[])
{
//BufferedReader bf = new
BufferedReader(new InputStreamReader(System.in));
//System.out.println("Please enter number:");
String message="CRYPTOGRAPHY";
char[] messagechar = message.toCharArray();
int len=message.length();
int nocol=len/3;
int encodematrix[][] = {{1,5,3}, {1,25,9}, {1,125,27}};
int messagematrix[][];
int er,ec; //encode matrix row & column
int mr,mc; //message matrix row & column
for(int i=0;i<len;i++)
{
System.out.println(messagechar[i]);
}
int[] ascii;
ascii = new int[1000];
//int to ascii
for(int i=0;i<len;i++)
{
int j=messagechar[i];
```

```
ascii[i]=j;
System.out.println(ascii[i]);
}
for(er=0;er<3;er++)
{
for(ec=0;ec<3;ec++)
{
System.out.println(encodematrix[er][ec]);
}
System.out.println();
}
```

The proposed algorithm acting major role to improve the security of the message by generating the cipher text. The attacker suppose knows the structure of the network used even it is impossible for them to find the exact output value .Besides with all the features of the encryption process, DNA cryptography is used to map the binary sequence of the cipher text to generate the desired DNA cipher sequence. It provides more forceful security for the plaintext.

CONCLUSION

In this paper the DNA cryptographic method has been used with neural network for the Encryption and Decryption purposes. XOR operation is used for the binary sequences where the message blocks generated form chaotic neural network. The User enables a secret key for the encryption and decryption process where as only the sender and the receiver can be able to open the data whereas no other third party can be involved to change or do any miscellaneous things during transmission. The Binary Sequence is converted into ASCI value and also a permutation function is used for generating the binary sequence from delayed chaotic neural network. These cryptographic Techniques perform high in security also with higher efficiency of transmission between the sender and the receiver. Furthermore the model can extended to images, audio and video.

REFERENCES

Ahsan Omer , Muhammad Imran Farooq (2015), 'DNA Cryptography Algorithms and Applications', DOI: 10.13140/RG.2.1.4892.5289.

Chen, J La Bean, TH Reif, JH (2003), 'DNA-based eryptography design', International Symposium on Circuits and Systems (ISCAS), pp. 822-825.

Chen, Z Xiutang , G (2014), 'Efficient DNA sticker algorithms to data encryption standard (2010)', Journal of Computational and Theoretical Nano science, Vol. 7, pp. 840-847.

Fu, C and Zhu, Z (2008), 'A chaotic image encryption scheme based on circular bit shift method', International Conference for Young Computer Scientists. pp. 3057–3061.

Klein, E Mislovaty, R Kanter, I Kinzel, W (2002), 'Public-channel cryptography using chaos synchronization', Physical Review, Vol. E 72.1.

Kritika Gupta, Shailendra Singh (2013), 'DNA Based Cryptographic Techniques: A Review', International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 3, Issue 3, pp. 607-610.

Leier, A Richter, C Banzhaf, W Rauhe, H (2000) "Cryptography with DNA binary strands.", Biosystems, Vol. 57, pp. 13-22.

Mansi Rathi, Shreyas Bhaskare, Tejas Kale (2016), 'Data Security Using DNA Cryptography', International Journal of Computer Science and Mobile Computing, Vol.5 Issue 10, pp. 123-129.

Mislovaty, R Klein, E Kanter, I Kinzel, W (2003), 'Public channel cryptography by synchronization of neural networks and chaotic maps," Physical review letters, vol. 91.11, pp. 118701.

Parravano, MG Cosenza, J Jiménez, A Marcano (2002), 'Coupled map networks as communication schemes', Physical Review, Vol. E 65.4.

Sreeja BP and Saratha Devi, G(2018), 'Wireless Sensor Network Applications: A Study', International Journal of Pure and Applied Mathematics Vol. 118, Issue 11, pp. 385-389.

Sreeja, BP Amrutha, K Jeni Benedicta, Kalaiselvi, Ranjanai (2018), 'Realization of speech in design intent of geometric modeling', International Journal of Engineering &Technology Vol. 7, Issue (1.3), pp. 121-124.

Sudipta Singha Roy, Shaikh Akib Shahriyar, Md. Asaf-Uddowla, (2017), 'A Novel Encryption Model for Text Messages using Delayed Chaotic Neural Network and DNA Cryptography', International Conference of Computer and Information Technology (ICCIT).

Weng Long Chang (2012), 'Fast Parallel DNA-Based Algorithms for Molecular Computation: Quadratic Congruence and Factoring Integers', IEEE Transactions on Nano bioscience, Vol. 11, Issue 1, pp.

Zhang, Q Lili, L and Xiaopeng, W (2014), 'Improved algorithm for image encryption based on DNA encoding and multi-chaotic maps', International Journal of Electronics and Communications, vol. 68, pp. 186-192.

BBRC

Bioscience Biotechnology
Research Communications

An Efficient Architecture of Internet of Things for Data Interoperability in Perspective to User Services

G. Saratha Devi[1]*, B.P. Sreeja[2] and R.N. Devendra Kumar[3]

[1,2]*Assistant Professor, Department of Information Technology, Karpagam College of Engineering, Coimbatore, TamilNadu, India*
[3]*Assistant Professor, Department of Computer Science and Engineering, Sri Ramakrishna Institute of Technology, Coimbatore, Tamilnadu*

ABSTRACT

Internet of Things provides a way to contribute to human society. IoT can be used for monitoring and alerting human health. Sensors play a major role in every IoT applications. The data obtained through sensors of health care applications should be accumulated and progressed for further analysis. Data density increases complexity for development and analysis of the big data for decision making. This paper discusses about fog device for data(FDD) architecture for the accomplishment of IoT to accumulate and progress sensor data for applications with maximum consistency and transparency which makes the users to produce own services on data.

KEY WORDS: INTERNET OF THINGS (IOT), FOG DEVICE TO DATA (FDD), CONSTRAINED APPLICATION PROTOCOL (COAP)

INTRODUCTION

In common, many databases and resources are required to store big data. On the other hand, storage and recovery are not the only problems. Receiving significant patterns from big data such as patient diagnostic information is also an essential problem. Large amount of body sensors devices have been developed for constant monitoring of healthcare, personal fitness and physical

activity alertness (Paradiso et al., 2005). Recently, many researchers have been trying to add up to many wearable clinical devices in remote health monitoring systems for constant monitoring of individual health condition (Ng et al., 2004).

For example, wearable sensor devices are used for signifying physiological exercises and food habits by a two three day period of constant physiological monitoring of patients. In this period wearable sensors would

constantly examine and store the patient's health data into a data store (Lorincz et al., 2004). This helps doctors in the finding the patient's health condition and get better results not only using laboratory tests, but also patient's health data collected from wearable body sensors. Thus, sensor data is most often used for taking appropriate action for patient's health and treatment suggestion, lifestyle choices and early identification that are important in improving the quality of patient health. This process requires the development of an efficient storage system for accumulating and processing of huge data (Ng et al., 2004). This paper discusses a protected architecture and execution of a consistent IoT architecture for dealing out and protecting real time sensor data using scalable big data technologies.

Fog Computing is a distributed computing infrastructure in which some application services are controlled at the network edge in a smart device while some others are controlled in a remote data center (e.g. a centralized Cloud). Sensors produce large amount of data through various devices forms the enormous data that hold the need for decision making.

MATERIAL AND METHODS

2.1 Big Data

Big Data originally meant the volume, velocity, and variety of data that becomes difficult to process when using traditional data processing platforms and techniques. Especially, big data plays a vital role in healthcare applications (Ng et al., 2004). Nowadays, modern healthcare systems are adopting quickly clinical data, which is used for increasing clinical record sizes available online (Yang et al., 2016).

In addition, new technologies and tools are identified for processing data of large size and gleaning new business insights from that analysis. As a result, a number of options are identified to use Big Data for reducing the cost of healthcare and to diagnose diseases (Yuehong et al., 2016).

Bates et al. (2014) have conducted a study on Big Data in healthcare and describe six use cases of Big Data to reduce healthcare cost (Koumpouros, et al., 2014). In addition, (Hermon and Williams, 2014) have divided the use cases of Big Data in healthcare into four main categories, namely, management and deliverance, clinical judgment support, sustain services and consumer activities (Chang et al., 2015).

Similarly, Jee and Kim (2013) have conducted a study that describes the manner of improvement in the healthcare system based on the Big Data analytics to improve the healthcare systems, select appropriate treatment path, and so on (Chang et al., 2015).

2.2 Cloud and fog computing

Cloud computing is the process of using internet for storing, managing data instead of using personal computer and a local server. In other words, cloud computing is a type of computing used for delivery of hosted services over the Internet to manage the real time applications, (Thilagavathi et al., 2014). Private cloud, a public cloud and a hybrid cloud are the models available for accessing resources stored in the cloud. Private cloud model not share physical resources other than particular organization. Public cloud can be used by public users for accessing physical resources Hybrid cloud model consists of private cloud that uses public cloud resources.Fog computing is used for improving the efficiency and to reduce the volume of data that needs to be transferred from the physical devices to the cloud (Manogaran et al., 2017).

Conventional cloud architectures results in high latency by moving all the data from the network to the data center. Even more number of protocols available with the IoT devices, cloud communicates only with Internet Protocol. Data analytics from many applications can be obtained through fog and cloud computing. Fog can be assumed with sensors for data collection and forwarding information to controllers, which uses the obtained information for analysis and actuators convert his information to mobile phones for users.

3. Internet of Things

The Internet of Things (IoT) is an interconnection of things or devices with network for exchanging data (Manogaran et al., 2017). As more number of devices cannot be connected in IPV4, IoT uses IPV6 for internet connectivity. An organized communication can be achieved in IoT through layered architecture. IoT Architecture comprises of four layers such as Sensor layer, network layer, data layer and application layer (Fig. 1). Sensors, actuators are the eminent technologies used in IoT. These devices interact with each other to meet the needs. Many protocols have been developed in all the layers of ISO stack to enable the operations of IoT devices. Constrained Application Protocol (CoAP)

Routing Protocol for Low-Power and Lossy Networks (RPL) messaging protocols are more familiar. These protocols are designed with energy preservation in mind, along with low compute and memory requirements (Yan et al., 2015).

As shown in Fig. 1, the data layer focus on collecting data from the sensor devices and to send collected data to data centers. Inorder to maintain consistency, all the different data formats available can be combined into unified data with independency. Data layer also comprises of securing the data connections between the devices and network.
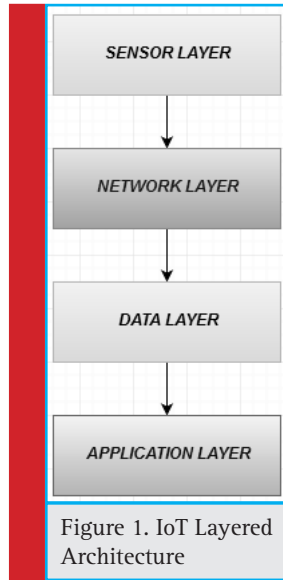
Figure 1. IoT Layered Architecture

PROPOSED METHOD

IoT devices producing large amount of data called big data. Analysis of such large data which is mixture of structured and unstructured data is very difficult. This paper proposes a new architecture for the implementation of Internet of Things (IoT) to accumulate and process scalable and consistent sensor data (big data) in health care applications for user services. The data flow for IoT architecture is represented in the flow diagram Fig. 2.
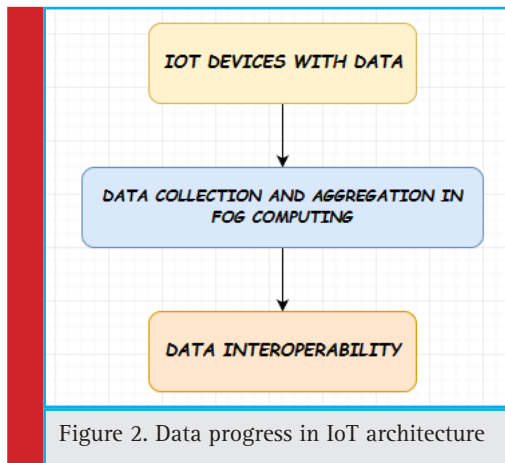

Figure 2. Data progress in IoT architecture

3.1 FDD architecture

The proposed architecture is Fog device for data (FDD) in IoT which consists of three layers namely, namely, data collection in IoT devices with data layer, data transfer in data collection and aggregation layer, and data interoperability layer using cloud.

- Data layer comprises of IoT devices for constant examination of the patient's health. The data is collected from the sensors of these IoT devices.

- Data Collection and Aggregation layer, the fog computing is used to track the data and resources of IoT devices by examining the performance. The deviation in performance of data in each device can be supplied as per the need to users.
- Data Interoperability layer is used to preprocess the data before storage .It also makes the data unified by converting all the collected data into a standard format. This data can be used for various services by uses.

3.2 Data Layer

The Data layer consists of devices consists of Arduino, Rasberry pi, RFID and the protocols such as http, IEEE 802. The information collected from the sensor that comprises of person's health information in each device becomes the essential data. Actuators plays major role by processing the information in the devices. Data is transmitted through the network by protocols through routing. Wireless transmission also occurs which is supported by protocols.

3.2.1 Data Collection and Aggregation layer

Fog devices located near the user location makes the data obtained from the sensors of each IoT devices through the network protocols for storage and computation. This reduces the latency of sharing data since fog devices are located on the edges rather than cloud. As the data monitored by the fog devices through the performance, the deviations can be reported and all the data such as structured and unstructured data is collected in this layer. Security of data plays a major role in this layer. Fog computing uses small servers compare to cloud which provide scalability and security. In order to achieve security, this layer accomplishes the security mechanisms such as encryption and decryption techniques.

3.3 Data Interoperability layer

As the data from the devices are collected in various formats, it is stored though various data centers and can be retrieved based on the need. Nowadays, this approach is growing in popularity because of the Internet of Things (IoT) and data generation speed (Li et al., 2013). However, it is just inefficient to transmit huge sensor data to the cloud for analysis and processing (Bates et al., 2014). It requires a huge communication link and secures integration architectures from end-to-end application (Varatharajan et al., 2017).

3.4 Computing to cloud computing

Fog computing is an extension of cloud computing. Fog computing is used for increasing the network bandwidth. Fog computing is also called fog networking used

for distribution the computing resources and application services in the cloud, (Manogaran et al., 2017). The main goal of fog computing is to improve scalability, efficiency and reduce the volume of data that needs to be transferred to the cloud for data analysis, processing, and storage. In a fog computing environment, data processing always takes place in a data hub on a mobile device or on the edge of the network in a gateway or smart router (Manogaran et al., 2017).

3.5 Consistency of Data

Consistency is achieved by exploiting the needed data from storage by data interoperability. The data is converted into standardized format in FDD architecture that enables the data to be unified in nature by common representation. This data interoperability nature links the architecture to the users through the mobile devices.

CONCLUSION

Thus IoT devices can be used for monitoring and alerting human health through sensors. The data obtained through sensors of health care applications should be accumulated and progressed for further analysis. As the density of the data increases complexity for development and analysis of the big data for decision making, fog device for data (FDD) architecture with consistency and transparency is looked forward for the accomplishment of IoT to accumulate and progress sensor data for applications for the users to produce own services on data.

REFERENCES

Bates, D Saria, S Ohno-Machado, L Shah, A Escobar, G, (2014), 'Big Data in health care: Using analytics to identify and manage high-risk and high-cost patients', Health Aff. Vol. 33, Issue 7, pp. 1123–1131.

Chang, H, (2015), 'Book review: Data-driven healthcare & analytics in a big data world', Healthcare Inform. Res. Vol. 21, Issue 1, PP. 61.

Eugene Siow, (2018), 'Analytics for the Internet of Things: A Survey'ACM Computing Surveys, Vol 1, No. 1, Article 1.

Gunesekran Manogaran, Varatharajan, R Daphne Lopez Priyan Malarvizhi Kumar (2017), 'A new architecture of Internet of Things and big data ecosystem for secured smart healthcare monitoring and alerting system', Future Generation Computer Systems.

Koumpouros, Y, (2014), 'Big data in healthcare, in: Information Resources Management Association (Ed.), Proc. Healthcare Administration: Concepts, Methodologies, Tools, and Applications', IGI Global, p. 23.

Li, S Da, L Xu, Wang, X, (2013), 'Compressed sensing signal and data acquisition in wireless sensor networks and internet of things', IEEE Trans. Ind. Inform. 9 (4), 2177–2186.

Lopez, D Gunasekaran, M Murugan, BS Kaur, H Abbas, KM, (2014), 'Spatial Big Data International

Lopez, D Gunasekaran, M, (2015), 'Spatial Big Data Assessment of vaccination strategies using fuzzy multi criteria decision making, Proceedings of the Fifth International Conference on Fuzzy and NeuroComputing (FANCCO-2015), Springer Interna-tional, pp. 195–208.

Lopez, D Sekaran, G, (2016), 'Climate change and disease dynamics - A big data perspective', Int. J. Infect. Dis. 45, 23–24.

Malan, D Fulford-Jones, T Welsh, M Moulton, S, (2004), 'Code-blue: An ad hoc sensor network

Paradiso, R Loriga, G Taccini, N, (2005), 'A wearable health care system based on knitted integrated sensors', IEEE Trans. Inform. Technol. Biomed. 9 (3) 337–344.

Thilagavathi, M Lopez, D Murugan, BS, (2014), 'Middleware for preserving privacy in Big Data, in: HandBook of Research on Cloud Infrastructures for Big Data Analytics', p. 419.

Thota, C Sundarasekar, R Manogaran, G Varatharajan, R Priyan, MK, (2018), 'Centralized fog computing security platform for IoT and cloud in healthcare system, in: Exploring the Convergence of Big Data and the Internet of Things', IGI Global, pp. 141–154.

Varatharajan, R Manogaran, G Priyan, MK. Balaş, VE Barna, C, (2017), 'Visual analysis of geospatial habitat suitability model based on inverse distance weighting with paired comparison analysis', Multimedia Tools Appl., 1–21.

Varatharajan, R Vasanth, K Gunasekaran, Priyan, M Gao, XZ, (2017), 'An adaptive decision based kriging interpolation algorithm for the removal of high density salt and pepper noise in images, Comput. Electr. Eng. (2017).

Yan, H Xu, LD Bi, Z Pang, Z Zhang, J Chen, Y, (2015), 'An emerging technology–wearable wireless sensor networks with applications in human health condition monitoring', J. Manag. Anal. 2 (2), 121–137.

Yang, B Stankevicius, D Marozas, V et al., (2016), 'Lifelogging data validation model for internet of things enabled healthcare system', IEEE Trans. Syst. Man Cybern.http://dx.doi.org/10.1109/TSMC20162586075. .

Yuehong, Y.I.N Zeng, Y Chen, X Fan, Y, (2016), 'The internet of things in healthcare: an overview', J. Ind. Inform. Integr. 1 3–13.

BBRC

Bioscience Biotechnology Research Communications

Trust Based Evaluation Model for Mitigating Selfish Nodes in Mobile Adhoc Networks

M. Selvakumar[1]*, P. Madhavan[2] and B. Sudhakar[3]

[1,3]*Department of Electronics and Communication Engineering, Annamalai University, Chidambaram, Tamilnadu, India*
[2]*Department of CSE, SRM Institute of Science and Technology, Kattankulathur, Tamilnadu*

ABSTRACT

This paper describes a Trusted Model for OLSR protocol for the computation of reliability of each node based on Residual Energy (RE), amount of Bandwidth and the Predicted Reliability Factor (PRF). The selfish behaviour of the mobile node in mobile adhoc network is analysed and the Trust Value (TV) is computed to mitigate various attacks. Residual energy based detection helps in computing the remaining energy of mobile nodes involved in routing. The Proposed model computes the TV based on RE..The nodes whose RE and TV go below the threshold limit are marked as malicious, and they are isolated from the network. The energy and trust based computation makes the system less vulnerable to security attacks.

KEY WORDS: TRUSTED MODEL, RESIDUAL ENERGY BASED DETECTION, PREDICTED RELIABILITY FACTOR (PRF)

INTRODUCTION

The dynamic nature and structure of MANETs has led to a variety of highly vulnerable attacks. The fundamental need for a secured networking is secure protocols that confirm the secrecy, accessibility, authenticity and reliability of network. The trust factor determines the level of security. The existing research works focus on subjective trust. The trust relation is categorized into direct and an indirect relations. Direct trust relation is maintained by each and every node. The trustworthy is analysed by noticing the neighbor characteristics in the routing process. It is usually based on nodes' observation and experience with its neighbours.

In indirect relation, the nodes whose communication range located outside are monitored. During the routing process, the network is covered with route request messages and route reply message. Evaluation of both direct

145

and indirect trust relations consume more amounts of bandwidth, energy and time in route discovery and lead to increased computational overhead, As the network topology keeps changing, trust management becomes tedious. Trust is included to mitigate routing attacks. The trust value of the individual are determined for data transfere from source node to destination node. These nodes target in getting advantage from the network and maintain their own resources such as, bandwidth,life of nodes battery. Selfish nodes struggle to make communication with the nodes they want to exchange and do not forward packets. A selfish node performs the below attainable actions in wireless adhoc network.The battery power is turned off during inactive mode and does not indulge in rebroadcast Route REQuest (RREQ) when it takes RREQ. In this, the source retransmits a RREQ but does not understand route to the destination.

It does not unicast/broadcast Route ERRor (RERR) packets when there is no route. It selectively drops the data packets. The selfish nodes reduce the delivery rate by dropping packets. The authors (Chiejina et al. 2015) have proposed a model that make use of monitor, a reputation manager, a punishment scheme. The overall reputation of nodes is directly proportional to the summation of the reputations of the nodes.The authors (Jin et al. 2005) propounded a trust evaluation technique for wireless sensor networks. The projected cluster-based trust evaluation method forms a cluster by considering the neighboring nodes and chooses one node as a CH. The model is aimed to restrict the limited information for the nodes which is unknown and thereby helps in reducing required memory space.

The authors (Wang & Fang 2007) validated Hierarchical Key Management Scheme (HKMS) for secure group communication in wireless networks. The data packets are encrypted twice for enhancing strong security. The authors (Hussein et al. 2010) used weighted distributed clustering technique called CBMD. It make use of Connectivity (C), residual Battery power (B), average Mobility (M), and Distance (D) to choose cluster heads. The ultimate aiml of this algorithm is the formation of stable clusters. This gives less overhead in terms of cluster formation and maintenance, and increases mobile node life time. It bends easily in assigning weights for creating clusters involuntarily.

The authors (Madhavan et al. 2016) proposed DFA based QoS clustering approach for prolonging the network life time. This algorithm takes energy of the mobile nodes to elect the reasonable number of cluster heads and outperforms the traditional AODV protocol.

The authors (Arboit et al. 2008) have propounded certificate revocation process for Wireless adhoc networks. In any wired communication networks, usally Certificate Authorities (CAs) joins the information concerning the certificates related to Certificate Revocation Lists (CRLs) and forward them to their respective entities.

The authors (Liu et al. 2013) have proposed a cluster based certificate revocation with vindication feature for MANETs. As mobile nodes possess easy mobility and dynamic properties ,it render them much susceptible to numerous security attacks in contrast to wired networks. The major objective is to ensure secured network services. To deal with this confront, certificate revocation is considered as a vital integral element to secure network communications. This work focuses on the problem of certificate revocation to segregate attackers from additional participation in network actions, (Chen et al. 2017; Vinothkumar et al. 2017).

The Cluster-based Certificate Revocation with Vindication Capability (CCRVC) scheme provides a fast and precise certificate revocation. The method improves the reliability of the scheme and also enhances the accuracy (Zhang, et al 2015). The threshold-based mechanism assists in finding the vindictive warned nodes as legitimate nodes or not, prior to recovering them. The authors (Amraoni et al. 2014) have dealt with the effect of selfish behavior on OLSR and AODV routing protocols in MANETs. Selfish behaviour is a big challenge as they may decrease the network performance (Sudhakar et al. 2018).

MATERIAL AND METHODS

PROPOSED TRUST AWARE METHODS

A. Dynamic Reputation Management

The repudation model consist of monitor, repudataion manager and punishment scheme. Initially, when the nodes join the network, they are not aware of the reputation values of the neighbouring nodes. The total reputation of a node is taken between [0, 2]. Further, the punitive module includes the punishment scheme and the path administrator.

The total reputation value of the nodes are stored in a node table and regularly updated. The total reputation value of the nodes should increase with the transmission and routing of control packets. The node status is calculated based on the total reputation value associated with a grading criterion. Further, the path administrator removes the nodes that are identified as bad from the route cache, based on the information received from the punishment scheme.

B. Selfish Node Detection

A selfish node operates in the route discovery and maintenance phases of a routing protocol. As already seen, it does not forward data packets but attempts to take

Figure 1. Block Diagram of Trusted system.
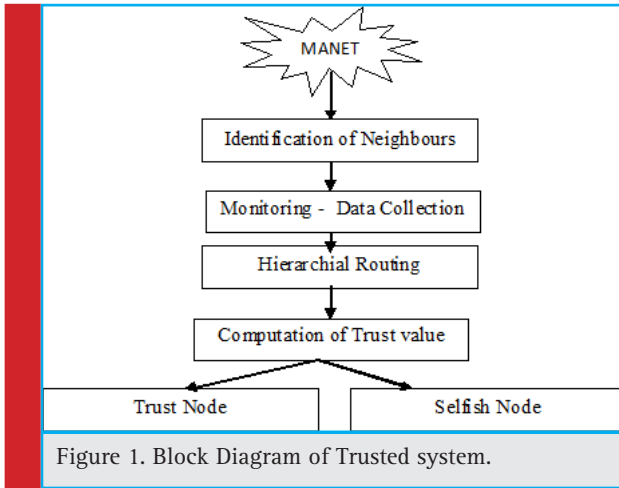
advantage from other nodes. The proposed model evaluates the trustworthiness of each node by considering the RE, amount of bandwidth utilized, number of packets sent and received, and the reliability rate. A selfish node may drop packets due to low energy,low data rate. This can be investigated by examining the routing entries of the neighbouring nodes of the malicious node.

Selfish behaviour of nodes degrades network performance. An algorithm is proposed to deal with the selfishness of nodes. It involves the following steps. The routing tables of the neighbouring nodes of the malicious node are not updated.

Initially, a Trust Value (TV) is calculated based on the behaviour of the neighbouring nodes, along with the RE of the nodes. Secondly, the available energy of the mobile nodes is used for analysis purpose. It concentrates on the possibility of a cooperative mobile node to alter its nature into a selfish node.

C. Residual Energy based Detection

A RE based selfish node isolation model is proposed to compute the available energy (E_{AVAIL}) of the mobile nodes in the routing path between the source and the destination based on the RE.RE can be defined as the total energy retained by a node after data transmission. The Energy Drain Rate (E_{DRAIN}) is the rate of energy dropped by a node participating in routing.The energy of a node at any instant of time 't'.

$$E_{AVAIL} = \frac{RE}{E_{DRAIN}} \quad (1)$$

The drain rate (Kim et al. 2003) of a node is calculated using exponential weightedmethod.

$$E_{DRAIN} = \rho \times E_{DRAIN}^{K} + (1-\rho)E_{DRAIN}^{K-1} \quad (2)$$

$$\rho = \frac{ENERGY_{TRANS}}{NUMBER\ OF\ HOPS} \quad (3)$$

where

ρ-Weighted average

E_{DRAIN}^{K}-Drain rate of a node at session 'k'

E_{DRAIN}^{K-1} Drain rate of node at session 'k-1'. ENERGY$_{TRAIN}$-Energy required for transmission.When the available energy (E_{AVAIL}) goes less than the threshold (E_{THRESH}), then the mobile node is identified as selfish.' E_{THRESH} - Threshold energy indispensable for a mobile node to be cooperative The value of threshold energy 'E_{THRESH}' is taken as 50 Joules (Patil et al. 2011).

The Packet Drop (PD_i) is the difference of the number of packets received (P_{REC}) from its neighbours by a node(i) and the number of packets relayed (P_{REL}) to the next hop neighboring nodes as shown in Equation (4.4).

$$PD_i = P_{REC} - P_{REL} \quad (4)$$

The Packet Drop Rate (PDR_i) of a node for every period is given by Equation (4.5)

$$PDR_i = \frac{PD_i}{P_{REC}} \quad (5)$$

where $1 \leq i \leq k$, Number of Sessions.

The Rate of Failure (FR) is the sum of the product of the PDR_i and weighted average of each session.

$$FR_{NODE} = \frac{\sum_{i=1}^{k} PDR_i}{k} \quad (6)$$

If the reliability factor for a node is less than 0.4, then the node is found to be selfish and isolated from the routing path. Once the selfish nodes are identified, the entire network is transformed to improve the performance.

RESULTS AND DISCUSSION

The performance of THRAC-OLSR is analysed by changing the scalability of mobile nodes. It is seen that it yields better results when compared to OLSR, E-OLSR. In the Figure 2, the performance of HRAC-OLSR protocols is analysed in terms of PDR by altering the number of nodes between 10 to 100 and its performance is compared with the existing OLSR and E-OLSR protocols (Madhavan 2016).

In figure 2, when the number of nodesis increased from 10 to 20, proposed system shows constant improvement in PDR but there exists slight degradation in existing OLSR and E-OLSR. When the network size grows from 40 to 100, the proposed model shows greater improvement in delivering the data packets in contrast to existing OLSR and E-OLSR protocols.

HRAC-OLSR offers better PDR in contrast to OLSR and E-OLSR. It yields 50% and 24% improved PDR when compared to OLSR and E-OLSR protocols respectively.
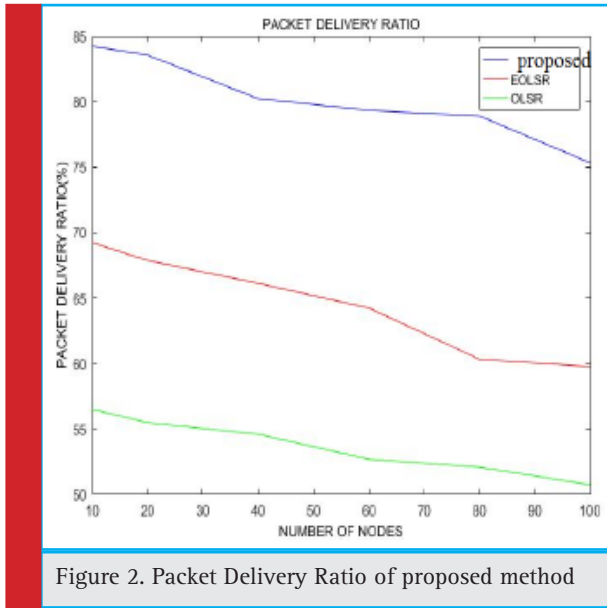
Figure 2. Packet Delivery Ratio of proposed method

Figure 4. Residual energy of proposed system

HRAC-OLSR offers better throughput when compared to existing OLSR and E-OLSR. In Figure 3, when the node size is increased from 20 to 100, throughput drastically decreases for OLSR and E-OLSR. But in HRAC-OLSR, there exists slight changes and it yields 46% and 33% improved throughput when compared to OLSR and E-OLSR protocols respectively.

In Figure 4, the performance of HRAC-OLSR protocol is analysed in terms of RE and its performance is compared with the existing OLSR and E-OLSR protocols by varying the node speed. As HRAC-OLSR is an energy aware protocol, the amount of energy consumed is reduced and hence offers more RE. HRAC-OLSR yields

	Packet Delivery Ratio(%)	Throughput (KB)	Residual Energy(J)
■ OLSR	50	46	47
■ E-OLSR	24	33	26

Figure 5. Overall performance improvement

41% and 28% higher RE in contrast to the OLSR and E-OLSR protocols respectively.

CONCLUSION

Trusted HRAC-OLSR (THRAC -OLSR) protocol was propounded to compute the reliability of each node based on the RE, amount of bandwidth used and the Predicted Reliability Factor (PRF), along with the number of packets received and forwarded. The selfish behaviour of the mobile node is analysed and the Trust Value (TV) is computed to mitigate various attacks. Residual energy based detection helps in computing the remaining energy of mobile nodes involved in routing. The nodes whose RE and TV go below the threshold limit are marked as

Figure 3. Throughput of proposed system

Table 1. Performance analysis of proposed model								
NUMBER OF NODES	PACKET DELIVERY RATIO (%)			THROUGHPUT (KB)			RESIDUAL ENERGY (J)		
	OLSR	E-OLSR	Proposed	OLSR	E-OLSR	Proposed	OLSR	E-OLSR	Proposed
10	57	69	84	2844	2946	4056	70	79	93
20	56	68	84	2674	2881	3950	65	72	89
40	55	66	80	2393	2591	3350	61	67	83
60	53	64	79	2100	2491	3150	53	61	79
80	52	60	79	2050	2233	3050	49	59	78
100	51	60	75	1994	2199	2890	45	58	76
AVERAGE	54	65	80.26	23433	25575	3408	57	66	83
PERFORMANCE IMPROVEMENT (%)	50	24		46	33		47	26	

malicious, and they are isolated from the network. The energy and trust based computation makes the system less vulnerable to security attacks.

REFERENCES

Amraoui, H, Habbani, A & Hajami, A (2014), Effect of selfish behaviour on OLSR and AODV routing protocols in MANETs, IEEE Proceedings of international conference in Computer & Information Technology (GSCIT),Global Summit: 1-6.

Arboit et al. (2008), A localized certificate revocation scheme for mobile ad hoc networks, Journal of Ad Hoc Networks, 6(1): 17-31.

Chiejina, E, Xiao, H & Christianson, B (2015), A dynamic reputation management system for mobile ad hoc networks', Journal of Computers, 4(2): 87-112.

Chen, H., Zhou, M., Xie, L., & Li, J. (2017). Cooperative spectrum sensing with M-ary quantized data in cognitive radio networks under SSDF attacks. IEEE Transactions on Wireless Communications, 16(8), 5244-5257.

Hussein et al. (2010), An efficient weighted distributed clustering algorithm for mobile ad hoc networks, IEEE Proceedings of international conference on computer engineering and systems: 221-228

Jin et al. (2005), Cluster-based trust evaluation scheme in an ad hoc network, Journal of ETRI, 27(4) : 465-468.

Kim et al. (2003), Routing mechanisms for mobile ad hoc networks based on the energy drain rate, IEEE Transactions on Mobile Computing, 2(2): 161-173

Liu et al. (2013), Cluster-based certificate revocation with vindication capability for mobile ad hoc networks, IEEE Transactions on parallel and distributed systems, 24(2):239-249.

Madhavan P, Malathi P (2016), Intelligent Framework for QoS Optimization in MANET using Soft Computing Models, International Journal of Advanced Engineering Technology, 7(2): 890-893.

Madhavan P,Malathi P (2016), DFA based QoS Aware Clustering for future prediction and performance improvement in MANET, Asian Journal of Information Technology,15(18):3513-3523.

Sudhakar, B. and Veluthai, M (2018), Brain Tumor Segmentation of MRI Image Using Gustaffson- Kessel (G-K) Fuzzy Algorithm International Journal on Future Revolution in Computer Science & Communication Engineering, 04(03): 163-168.

Vinoth Kumar K, Jayasankar T, Prabhakaran M and Srinivasan V (2017), Fuzzy Logic based Efficient Multipath Routing for Mobile Adhoc Networks, Appl. Math. Inf. Sci. Vol. 11, No. 2, pp. 449–455.

Vinoth Kumar K, Dr. S. Bhavani (2015), Trust Based Multipath Authentication Protocol for Mobile Ad Hoc Network" **Journal of Computational and Theoretical Nanoscience**, Volume 12, Number 12, pp. 5479-5485(7).

Vinoth Kumar K, S. Bhavani (2015), An Effective Localization based Optimized Energy Routing for MANET" Journal of Theoretical and Applied Information Technology, ISSN: 1992-8645, E-ISSN: 1817-3195, Vol. 77. No. 2.

Wang, NC, & Fang, SZ (2007), A hierarchical key management scheme for secure group communications in mobile ad hoc networks, Journal of Systems and Software, 80(10): 1667-1677.

Zhang, L., Ding, G., Wu, Q., Zou, Y., Han, Z., & Wang, J. (2015). Byzantine attack and defense in cognitive radio networks: A survey. IEEE Communications Surveys & Tutorials, 17(3), 1342-1363.

BBRC

Bioscience Biotechnology
Research Communications

Impact of variable Packet Size on the performance Evaluation of New Broadcasting Approaches in Wireless Mobile Ad Hoc Networks

E. Gnanamanoharan*, S. Sivagnanam, G. Ramprabhu and M. Saravanan

Department of Electronics and Communication Engineering, Annamalai University, Chidambaram, Tamilnadu, India

ABSTRACT

Mobile Ad hoc Networks (MANET) have become an exciting and important technology in recent years because of the rapid proliferation of wireless nodes. They consist of wireless host that can move freely, rapidly changing, which are likely composed of relatively limited bandwidth and low powered wireless links. MANET is a wireless mobile network in which mobile nodes can transmit and receive without any fixed infrastructure and can be distributed for many applications such as soldiers relaying critical information, business associates sharing information during get together. When transmitting the packets from source to destination, packet size is very important parameter because once changing the packet size and also changing the performance of the MANET network. The aim of this research is to assess the effects of different packet size with the implementation of new broadcasting approaches in MANET through the simulation method. The results achieved from the test have been evaluated using the metrics assigned, throughput and packet delivery ratio (PDR).

KEY WORDS: MANETS, ROUTING PROTOCOL, REACTIVE, PROACTIVE, HYBRID, BROADCASTING TECHNIQUES, DYNAMIC TOPOLOGY

INTRODUCTION

MANET Routing protocol is a set of rules which monitors the traversing of message packets from source to destination in a network. MANET has different types of routing protocols and each of them is applied according to the network circumstances. The major types of routing protocols are proactive, reactive and hybrid. Proactive (or Table driven) routing protocols attempt to maintain up-to-date routing information to all nodes by periodically disseminating topological updates throughout the network and thus suffer the disadvantage of additional

150

control traffic that is needed to continually update stale route entries. Reactive (or On-demand) routing protocols attempt to discover a route only when a route is needed and Hybrid protocols inherit the features from both proactive and reactive routing protocols. The topology of the network changing often or quickly due to mobility of the nodes and is an important aspect in the design of effective routing algorithm which should be efficient and consistent to discover new routes and maintain them till the successful delivery of packets between appropriate source destination pair. The mobility of a node is always been one of the important characteristics in determining the overall performance of the Ad hoc network.

Perkins and Bhagwat, (1994) developed DSDV reactive routing protocol to calculate the shortest number of hops to the destination. There is increasing of routing overhead due to exchange of routing information in dynamic network scenarios and solutions are given for issues related to route discovery and maintenance. Perkins and Royer, (1999) developed the Ad hoc On-demand Distance Vector (AODV) and this is one of the most significant contributions to MANET routing.

Jose Moses et al (2012) evaluated the performance of AODV, DSR and DSDV with Constant Bit Rate (CBR) traffic and it is effective for scalable performance with 40 nodes. Zhou and Li, (2012) observed that the increase in the density of nodes yields an increase in the mean end-to-end delay and increase in the pause time leads to a decrease in the mean end-to-end delay. Mehmood, (2014) has given a comprehensive performance analysis of DSR, AODV, and DSDV routing protocol for different metrics in different scenarios.

Mohammed et al (2009) conducted comprehensive simulation study on the multipath routing protocols for mobile Ad hoc networks. Deepak and Yogesh, (2011) presented a probabilistic broadcasting algorithm based on traffic analysis. Manickam et al (2011) analyzed the performance of the three well known protocols AODV, DSR and DSDV with respect to variable node density. Boukerche et al (2011) presented a detailed survey of proactive, reactive and hybrid routing protocols and evaluated the performance metrics.

Camp et al (2002) discussed the salient feature mobility models to establishe a relationship between path duration and MANET design parameters including node density, transmission range, number of hops and velocity of nodes. Divecha et al (2007) analyzed the performance of DSR and DSDV routing protocols with different mobility models. Ni et al (1999) discussed the issues of broadcast storm problem due to blind flooding which leads to degradation of entire network performance.

Cartigny and Simplot, (2003) proposed an algorithm which combines the advantages of both probabilistic and distance methods to privilege the retransmission by nodes that are located at the radio border of the sender. Zhang and Agrawal, (2004) proposed a scheme that reduces blind flooding by fixing the probability high when receiving a broadcast packet for the first time in the network. Kim et al (2004) described a probabilistic method for on demand route discovery, where the probability to forward an RREQ packet is determined by the number of duplicate RREQ packets received at a node.

Abdulai et al (2007) investigated the effects of pause time setting for AODV routing protocol using Random Point Group mobility model (RPGM). Abdalla et al (2008) proposed a dynamic probabilistic broadcasting scheme for MANETs where nodes move according to way point mobility model and this approach dynamically sets the value of the rebroadcast probability for every host node according to the neighborhood information.

Ghosh et al (2004) proposed a secure routing solution to find an end-to-end route free of malicious nodes with the collaborative effort from the neighbors. Mohammadizadeh et al (2009) discussed that the original AODV protocol included no security mechanisms meaning that it is vulnerable to attacks which target the network routing protocol functions such as sequence number or hop count manipulation.

MATERIAL AND METHODS

Broadcasting is an essential building block of any MANET, so it is imperative to utilize the most efficient broadcast methods possible to ensure a reliable network. Broadcasting MANET [9] poses more challenges than in wired networks due to node mobility and scarce system resources. Because of the mobility there is no single optimal scheme for all scenario. Broadcasting methods have been categorised into four families utilising the IEEE 802.11 MAC specifications. Simple flooding requires each node in a MANET to rebroadcast all packets and probability based [4] assigns probabilities to each node to rebroadcast depending on the topology of the network. Area based common transmission distance is assumed and a node will rebroadcast if there is sufficient coverage area and Neighbourhood based, State on the neighbourhood is maintained by neighbourhood method, the information obtained from the neighbouring nodes is used for rebroadcast Apart from simple flooding, each broadcasting category aims at optimising energy and bandwidth by minimising message retransmission.

A. Neighbor Aware Ad Hoc On–Demand Distance Vector (NAAODV)

Neighbour Aware AODV (NAAODV) a new approach based on existing standard AODV protocol is presented.

The overall network performance is affected by increased routing overhead delay and reduced throughput due to unsighted flooding of redundant Route Request (RREQ) packets to entire set of nodes. The data dissemination concept is based on the neighbor presence and energy information whether the neighbor has adequate energy for effective routing. Thus the optimization of rebroadcast of RREQ is based on composite metric of neighbor presence and most recent remaining energy information to select the best and stable route in between source and destination using Route Reply (RREP) packet.

The NAAODV scheme is based on AODV [7]. In this modified approach, the routing decision is made based on the energy information of the nodes. The route request packet is broadcasted to their neighbors by the source node if there is no valid route to the destination. After receiving the route request packets, the neighbors check their table whether it has the route. If it doesn't have the route, it will forward the packets to its neighbors. The duplication of route request packets is avoided using the sequence numbers. The sequence number of the received packet is checked with the existing one for the same packet. If the received sequence number is greater than the existing one, it will be replaced. Otherwise the existing entry will be maintained. Here, the transmission of route request packets happens after getting the information about remaining energy of the node.

B. Broadcast Neighbour Discovery Scheme (BNDS)

Broadcast Neighbor Discovery Scheme (BNDS) is a new broadcasting approach to minimize the effect of flooding by reducing the redundant broadcast and thus the routing overhead is also reduced. In BNDS, each node maintains a parameter as neighbor degree which is the largest number of one hop neighbors with source node. The source node selects a subset of its neighbors for forwarding the packet being broadcasted to additional nodes based on the neighbor degree. The aim of this scheme is to minimize the effect of flooding by reducing redundant broadcasts and reduces the routing overhead. Each node keeps knowledge of their neighbors within one hop and two hops radius that is accomplished by periodic hello messages. Each message contains the node address and a list of known neighbors. When a client receives a "hello" packet from all its neighbors, it accepts a two-hop topology information i.e. only packets that would reach additional neighbors are rebroadcast and select a particular set of the node to forward the broadcast packet to their one-hop neighbors. The sender chooses group of one hop neighbors for forwarding the broadcast packet includes their addresses in the packet header and broadcasts the packet. Those particular set of nodes that receive the broadcast packets are forwarding nodes if the address is contained in the packet header.

Otherwise, it simply drops the received packet. Neighbor nodes repeat the same process carried by the sender. The selection of forwarding node based on the largest number of neighbors among one hop neighbors with the sender is called neighbor degree, if an intermediate node. When an RREQ packet reaches its destination node, the destination sends a reply to the source of the request, and it does not forward the packet. Information on neighbors that used in the proposed schemes is obtained via "hello" messages that are exchanged periodically similar with conventional AODV.

Each node follows a parameter called the node degree d, where the degree of node N, degree (N), is the number of one-hop neighbors with this node. The degree of a node is equal to the size of that nodes neighbor table and this table contains an entry for each neighbor updated from within specified time intervals. The merit of the degree considered as the largest number one hop neighbor in the network. Each node broadcasts a "hello" message containing its address and degree and a node frequently updates its routing and neighbor tables containing the addresses of all nodes one-hop neighbors and their degrees sorted in the decreasing order. If a source node S want to transmit the data packet to destination D, it starts sending RREQ to its nearest one hop neighbors and need to choose first three or four forwarding nodes based on the order of largest degree. There is further need to optimize the act of forwarding nodes (F) depending on the density of the nodes. F is choosen as three in this work. The source node appends their addresses in the RREQ message. Upon receiving the RREQ message, only those nodes whose addresses are among the address of F neighbors will process the message and rebroadcast it further.

C. Neighbour Discovery And Location Verification (NDLV)

A Neighbor Discovery and Location Verification (NDLV) is another new scheme proposed to protect the network from adversary nodes and to improve the performance by verifying the location of neighbor nodes. Due to random movement, neighbor nodes comes into the coverage area of a base station and leaves at every fraction of time, which must be trusted for service handling. It is usually assumed that nodes are cooperative in MANET routing algorithms and adversary nodes could easily become an important routing agent and disrupt network operations by disobeying the protocol specifications and make considerable amount of performance degradation. The NDLV scheme identifies a trusted neighbor nodes by extracting timing, finding location and computing the distance between each pair of nodes and utilized to protect the network from adversary nodes by verifying the location of neighbor nodes to improve performance and efficiency in MANET's.

D. Probabilistic Broadcast Ad Hoc On–Demand Distance Vector (PBAODV)

On-demand routing protocols discover a route between source destination pair with help neighbors information and they never need of topological information [21] about the entire network, and thus there is no periodic update of routing information but efficient route discovery approach is very important to improve the network performance. When a sender needs a route to some destination, it broadcasts a RREQ packet to its one hop neighbors. Every neighboring node rebroadcasts the received RREQ packet [3] only once if it has no valid route to the destination. Each intermediate node that forwards the RREQ packet creates a reverse route pointing towards the sender. When the desired destination node or an intermediate node with a valid route to the destination receives the RREQ packet, it replies by sending a route reply (RREP) packet. The RREP packet is unicast towards the sender along the reverse path set-up by the forwarded RREQ packet. In traditional AODV, an intermediate node rebroadcasts all RREQ packets that are received for the first time. Assuming no intermediate node has a valid route to the destination and N_t is the total number of nodes in the network, the number of possible rebroadcast in AODV is $N_t - 1$. The basic probabilistic broadcast route discovery is simple. A source node sends an RREQ to its immediate neighbors with probability of broadcast $P_b=1$. When an intermediate node first receives the RREQ packet, with probability $p_b < 1$ it rebroadcasts the packet to its neighbors and with forwarding probability $1 - P_b$ it simply drop the packet. Since the decision of each node to rebroadcast a packet is independent, the possible number of rebroadcasts is $P_b \times (N_t - 1)$.

Prediction of density of node in the network is not always feasible because of mobility speed. Under such conditions, fixed probabilistic route discovery can suffer from a degree of inflexibility, since every node is assigned as fixed probability regardless of current status of the network. Forwarding probability should be high if a node located in a denser region compared with sparse region. Dynamic probabilistic route discovery approach is used to adjust the forwarding probability at a node based on local neighborhood information gathered. If the number of neighbors is more than the average number of neighbors Na and such node is located at a dense region is considered. The neighborhood information is obtained by "hello" protocol to construct a 1-hop neighbor list at every node. A node that receives a hello packet from its neighbor node N periodically, creates an entry for N first time, else it updates the entry for N. If there is no periodic hello for a particular node for with in time of threshold that node is no longer valid and removes the entry for N from its neighbor table.

The hello interval and its size can drastically consume the network resource and degrade the overall performance of the network. But the frequency of hello packets would be beneficial factor for the accuracy neighbor information. A size of 4 bytes and 2 bytes of hello packets with identification number respectively at a interval of 1.5 seconds is selected. Finally the probability of broadcast P_b at a node is set low when relatively large percentage of its 1-hop neighbors are covered by the broadcast and region is considered as dense. Also, the probability P_b is set high when small percentage of its neighbors is covered and region is considered as sparse and broadcast probability is adapts dynamically the at each node according to the number of neighbors.

RESULTS AND DISCUSSION

The simulation carried out with the Network Simulator (NS) version 2.34 event driven open source software on a platform with and Ubuntu 9.10. Network Simulator-2 (NS-2) is extensively used in the research community. It is one of the most popular simulator developed by VINT project and it`s a discrete event driven, object oriented network simulating tool, very much used by the researchers, professors and students. Simulation is the process of creating a model with its behavior. The table 1 shows the parameters fixed for entire simulation analysis of the four different approaches.

The four main performance metrics that substantially affect the performance of routing protocol are "throughput", "end to end delay", "Packet Delivery Ratio" (PDR) and "Routing Overhead" (RO). The throughput is measured by the total received size during the time elapsed between sending and receiving. A data packet experiences delay while crossing from source to destination including all possible delays caused by buffering during route discovery delay, queuing at the interface queues and retransmission delays at the MAC, propagation and transfer times known. This total is called as end-to-end delay. The packet delivery ratio is calculated from the ratio of number of data packets sent from the source number of data packets received at the destination.

A. Comparison of Throughput

Fig.1 depicts the variation of throughput of NAAODV, BNDS, NDLV and PB-AODV for different packet size from 256 to 1024 bytes. It is evident that the three approaches BNDS, NDLV and NAAODV show closer performance and provide better throughput for different packet size from 256 to 1024 bytes. The performance of PBAODV is degraded overall than other three techniques. It would be an interesting prospect to examine further the effects of probabilistic broadcast method with impact of mobility speed.

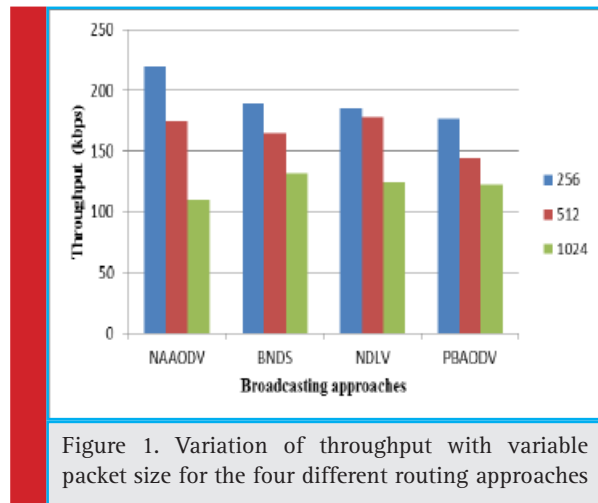| Table 1. Simulation Parameters	
Parameter	**Value**
Simulator	NS2(Version-2.35)
Simulation area x (m)	1000m
Simulation area y (m)	1000m
Transmission range	250m
Mobility speed	10,20,30,40 m/s
Number of nodes	50
Traffic type	VBR
Mobility model	Random way point
Packet rate	8 packets/sec
Packet size	256,512,1024 bytes
Protocols	NAAAODV, BNDS, NDLV, PBAODV
Simulation time	50s

Figure 1. Variation of throughput with variable packet size for the four different routing approaches

B. Comparison of Delay

Fig. 2 Shows the variation of delay of NAAODV, BNDS, NDLV and PBAODV for variable packet size. The results
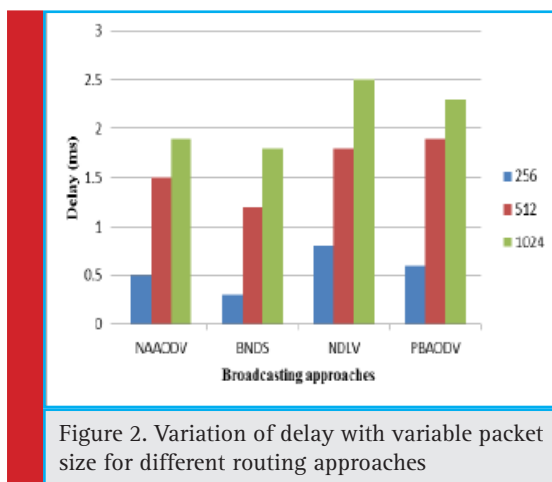

Figure 2. Variation of delay with variable packet size for different routing approaches

have revealed BNDS exhibit superior performance than all the three techniques. It is evident that the three approaches BNDS, NDLV and NAAODV consumes maximum delay at 1024 bytes. The performance of NDLV is degraded overall than other three techniques.

C. Comparison of Packet Delivery Ratio

The bar chart shown in Fig.3 shows the variation of packet delivery ratio for varying in packet size. It is seen that the delivery ratio for all the approaches is greater than 70 percent at 256 bytes. The NDLV and PBAODV have in general higher packet delivery ratio than other schemes and delivers the average of PDR 76%.
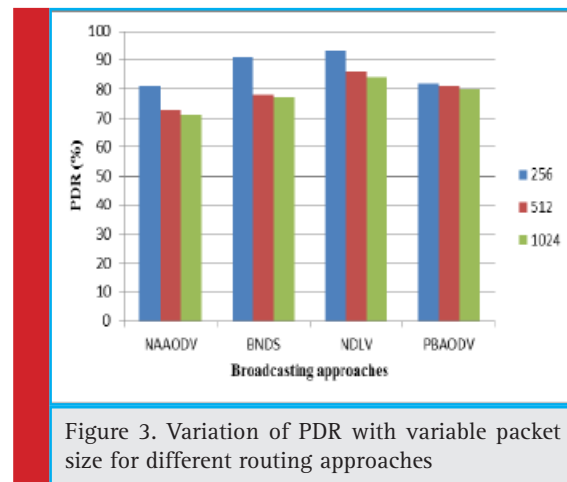

Figure 3. Variation of PDR with variable packet size for different routing approaches

D. Comparison of Routing overhead

Fig.4 depicts the variation of routing overhead (in packets) of NAAODV, BNDS, NDLV and PBAODV for variable packet size. For the packet size 1024 bytes all the four approaches has increased routing overhead. It is seen that PBAODV has larger routing overhead other than the three approaches..
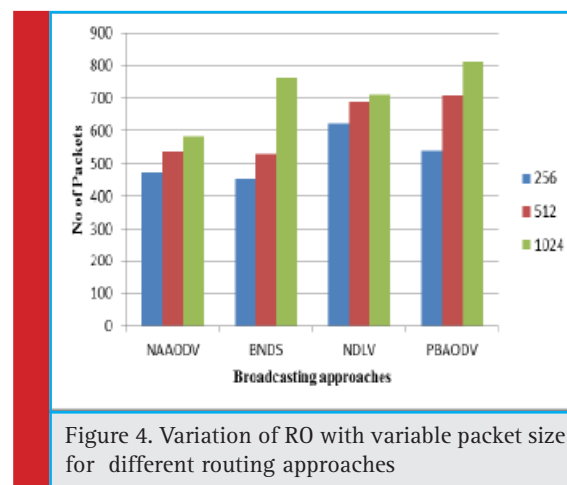

Figure 4. Variation of RO with variable packet size for different routing approaches

CONCLUSION

In this paper an effort has been made on the comprehensive examination and comparative study of four different new broadcasting approaches with various packet sizes. In NDLV, the routing overhead increases with the frequency of location verification and classification and effective in identifying nodes claiming false location but unlikely presence of fully collinear network topologies can degrade the e effectiveness of NDLV. NAAODV exhibits superior performance in terms of throughput, delay and packet delivery ratio compared with other three approaches with variable packet size. NDLV has increased PDR when the packet size is 256 bytes and overhead is increased with 1024 bytes. The performance of NAAODV routing approach was better than other three routing protocols. The overall performance of NAAODV and BNDS in better than the other two protocols except in the PDR and RO.

REFERENCES

Abdalla, M., and Hanashi (2008), Improving Route Discovery of Dynamic Probabilistic Flooding in On-Demand Routing Protocols for MANETs, Proceedings of 10th Telecommunications Forum, pp. 89-92.

Abdulai, J., Ould-Khaoua, M., and Mackenzie, L.M., (2007), Improving Probabilistic Route Discovery in Mobile Ad Hoc Networks, 32nd IEEE Conference on Local Computer Networks (LCN 2007) IEEE Computer Society Press, pp. 739-746.

Boukerche., Azzedine., Begumhan Turgut., Nevin Aydin., Mohammad. Ahmad, Z., Ladislau Boloni., and Damla Turgut., (2011), Routing protocols in ad hoc networks: A survey, Computer networks, Vol. 55(13), pp. 3032-3080.

Camp, T., Boleng,v., and Davies, V., (2002), A survey of mobility models for Ad hoc network research, Wireless Communications & Mobile Computing (WCMC), Special issue on Mobile Ad Hoc Networking, Research,Trends and Applications, Vol. 2(5), pp. 483-502.

Cartigny, J., and Simplot, D (2003), Border node retransmission based probabilistic broadcast protocols in Ad Hoc networks, Telecommunication Systems, Vol. 22(1), pp. 189–204.

Deepak. D., and Yogesh, C (2011), Traffic based analysis of efficient and dynamic probabilistic broadcasting algorithm in MANETs routing protocols, International Journal of Wireless and Mobile Networks, Vol. 3(01), pp. 108-116.

Divecha, B., Abraham, A. , Grosan, C.., and Sanyal, S., (2007), Analysis of Dynamic Source Routing and Destination-Sequenced Distance-Vector Protocols for Different Mobility models, Proceedings of First Asia International Conference on Modelling and Simulation, pp. 224-229.

Gnanamanoharan, E., and Bensraj, R., (2014), Impact of Variable Bit Rate and Packet Size on the Performance Evaluation of Neighbor Aware AODV and DSDV Routing Protocols for MANET's, International Journal of Computer Applications, Vol. 92(08), pp. 43-47.

Ghosh, T., Pissinou, N., and Makki, K., Collaborative trust-based secure routing against colluding malicious nodes in multi-hop ad hoc networks, Annual Conference on Local Computer Networks (LCN), pp.224-231.

Haas, Z., Halpern, J. Y., and Li, L., (2002), Gossip-based Ad hoc routing, Proceedings of IEEE INFOCOM '02, Vol. 21, pp. 1707-1716.

Jaafar, M. A. and Zukarnain, Z. A (2009), Performance Comparisons of AODV, Secure AODV and Adaptive Secure AODV Routing Protocols in Free Attack Simulation Environment, European Journal of Scientific Research, vol. 32(03), pp. 430-443.

Jagmeet Kaur., and Prabhjit Singh., (2016), Designing a Distributed Framework to Detect a Selfish Node in MANET by using a Collaborative Approach, International Journal of Computer Science Trends and Technology, Vol. 4(04).

Jose Moses, G., Sunil Kumar, D., Suresh, P., Varma., and Supriya, N., (2012), A Simulation Based Study of AODV, DSR, DSDV Routing Protocols in MANET Using NS-2, International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 02 (03), pp 43-51.

Kim, J.S., Zhang, Q., and Agrawal, D. P., (2004), Probabilistic broadcasting based on coverage area and neighbour confirmation in mobile ad Hoc networks, Proceedings of IEEE Global Telecommunications Conference Workshops (GlobeCom'2004), pp. 96-101.

Manickam, P., Guru Baskar, T., Girija, M., and Manimegalai, D., (2011), Performance Comparisons Of Routing Protocols In Mobile Ad Hoc Networks, International Journal of Wireless & Mobile Networks (IJWMN), Vol. 03 (01), pp. 98-106.

Mehmood, Z, (2014), Comprehensive experimental performance analysis of DSR, AODV and DSDV routing protocol for different metrics values with predefined constraints, International Journal of Information technology and computer science, pp. 24-31.

Mohammadizadeh., Moyaghar, A., and Safi, M., (2009), SEAODV: Secure Efficient AODV Routing Protocol for MANETs Networks, Proceedings of 2nd International Conference on Interaction Sciences: Information Technology, Culture and Human, Seoul, Korea, Vol. 24, pp. 940-944.

Mohammed Tarique., Kemal Tepe, E., Sasan Adibi., and Shervin Erfani., (2009), A survey on the multipath routing protocols for mobile ad hoc networks, Journal of Networks and Computer Applications, Vol. 32 (06), pp. 1125-1143.

Ni, S.Y., Tseng, Y.C., Chen, Y.S., and Sheu, J.P. (1999), The broadcast storm problem in a mobile Ad hoc networks, Proceedings of the 5th Annual ACM/IEEE International Conference on Mobile Computing and Networking, pp.152-162.

Williams, B., and Camp, T (2002), Comparison of broadcasting techniques for mobile ad hoc networks, Proceedings of the 3ˆrd ACM International Symposium on Mobile Ad hoc Networking & Computing, MOBIHOC, pp. 194 - 205.

Zhou, P., and Li, W (2012), A bidirectional backup routing protocol for mobile Ad hoc networks, Proceedings of the 2nd IEEE International Conference on Business Computing and Global Information (BCGIN '12), pp . 603–606.

Zhang, Qi., and Agrawal, D.P (2004), Analysis of Leveled Probabilistic Routing in Mobile ad hoc Networks, IEEE International Conference on Communications, Vol.07, pp. 3896-3900.