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3D Mapping of Human Body Temperature Using Optical Fiberbragg Grating Sensor

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ABSTRACT

Body temperature plays a vital role in analyzing the humanoid conditions and provides a numerous observation about health. The base model of temperature mapping on humanoid body is provided by finite method. Because of some complication it is difficult to retain very accurate model for human body temperature. The main aim of this paper to predicate 3D mapping of temperature by fiber optics and Genetic algorithm-Back propagation neural network. In the proposed information driven technique by analyzing the minor points on the body we can able to determine whole body temperature for mapping. A numerous attempts where done to examine the human body temperature in various environmental conditions. In each distinct setting the information estimated and the information yield were analyzed. The mean absolute error (MAE) is a amount of difference between two continuous variables in this way all the examination is 0.10°C which is very close to medical accuracy. The final approach shows that the result is faultless and consistent, so that it provides the gateway for analyzing mapping of temperature can be use in therapeutic and home care.

KEY WORDS: BODY TEMPERATURE; 3D MAPPING; ACCELERATED GENETIC ALGORITHM; GENETIC ALGORITHM-BACK PROPAGATION NEURAL NETWORK

INTRODUCTION

In general the human body temperature changes for age, exertion, infection ,and the time of day, the place in the body at which the measurement is made, and the subject's state of consciousness. Temperature control (thermoregulation) is part of a homeostatic mechanism that keeps the body parts at optimum temperature, as the temperature affects the rate of chemicalreactions. Temperature also changes with the difference in seasons during each year. Humans living in various climates may have different seasonal patterns. Increased physi-

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cal fitness will enlarges the daily change in temperature (Rajan 2015e).

An assortment of flow clinical examinations have delineated the possibilities of utilizing skin temperature to analyze a significant number ailments and screen ailment advance because of the actualities between stand-out skin temperature parameters and positive infirmities, for example, diabetes, rest illnesses (Garami et al. 2014), nadequate spinal line injuries. In these investigations, human body pores and human skin temperature appropriation impassive human locales incredibly proposes remarkably high connection to confusion finding. Strikingly, it is additionally central to set up the right three-dimensional (3D) connections among's pores and skin warm measurements and human patho physiology for the determination of scatters, for example, vascular disease and bosom malignancy. The ebb and flow models for skin temperature mapping are generally developed by the constrained segment technique (Rajan et al. 2015a).

In this study, we introduced data driven technique consolidating human body temperature estimation of common skin centers using fiber Bragg granulating (FBG) sensors and advanced Genetic algorithm-Back propagation neural framework for complete human skin temperature mapping (Hasselberg et al. 2013). The data driven procedure for parameter analysis expects to use assembled estimation data to develop data driven models. This system has to figure the exhaustion period of aircraft turbine circle composites By and large, information driven desire computations consolidate the fake neural mastermind (ANN), self-dealing with control (SOM) neural sort out, back-expansion (BP) neural framework (Rajan et al. 2015d).

By using these techniques, Back propagation neural system has been used to develop the work estimate and example acknowledgment due to its great self-learning, self-adjusting, speculation capacity and vigor (Rajan et al. 2015b). It likewise has a few disadvantages, including worst rate of union, and stalling out in nearby least effortlessly. To beat these disadvantages, numerous advancement calculations have been presented, for example, molecule swarm advancement calculation and hereditary calculation (GA) . To enhance the weight Genetic algorithm can be utilized and predisposition estimations of Back propagation neural system (Rajan et al. 2015c). GA is a heuristic stochastic interest figuring as a result of its extraordinary overall looking for limit and close perfect plan without edge information of mix-up work; In this investigation, we acquaint a calculation with upgrade the typical GA's determination region to dodge intelligence issue (Kenny et al. 2016). We thusly utilize enhanced Genetic algorithm-Back propagation neural network to set up the mannequin to anticipate the human skin temperature of whole body basically in light of just a couple of run of the mill insights focuses estimated by our FBG sensor exhibit.

HUMAN BODY TEMPERATURE MEASUREMENT USING FIBER BRAGG GRATING

Fiber bragg grating are prepared through showing the main part of the one mode fiber to a constant form of extreme UV light perpetually rise the fiber core part of the refractive index, producing a permanent variation index (Lahiri et al. 2012). Thus, the replicated warm over the FBG instrument sensor crosses across the 1X 2 coupler once more and through circulator. In the wake of presence, it is validated by inspective expert, the demodulated insights is spared and deliver the information securing framework (McCallum et al. 2012). The broadband light sources have maximum capacity of data transfer in the range of 1525-1565 nm.

DRIVEN MODEL INFORMATION AND ITS PROCESS

Temperature of skin Circulation Source

Consider a glow trade feature of some various body parts, for the present human life structures data, and body can be generally apportioned into 15 territories

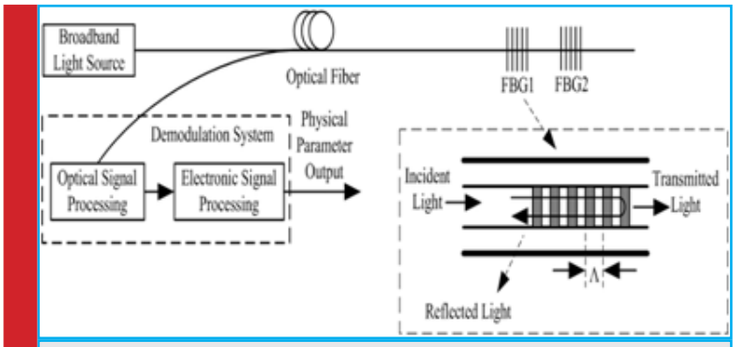

Figure 1. Schematic of fiber Bragg grating detecting framework.

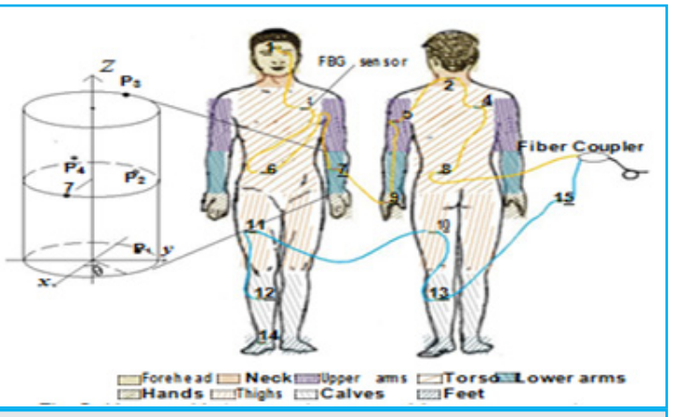

Figure 2. Wearable estimation framework and setting up for skin temperature.

(Mohanapriya et al. 2013). The external temperature surface movement of strong adult children is same, also those infection differentiate among the looking at same zones from left to right direction which should not exit more than 0.27°C. By then we develop nine information driven models which extend over the human frame. Every division consumes several dimensions; it has a tendency to be unraveled as a chamber. Thus, we use tube formed headings to develop the model of temperature transport for each division (Rajan et al. 2017). Taking the lower arm for example as showed up in the tube molded headings, the root is the point of convergence of the lower arm wrist; the center point of Z looks like lower arm in longitudinal track.

Temperature Circulation of Human using Data-driven Concepts

The recommended statistics driven mannequin is to set up the representing of skin temperature through up singular models for every portion, act as a matter of first importance, we squeeze Back the propagation process of neural networks in order to set up such discontinuous correlation of estimation focuses and subjective records focuses in the relating portion (Rajan et al. 2013). The temperature of each self-assertive factor can be foreseen with its known directions the utilization of the proposed display, and thusly mapping the temperature of that area can be precisely anticipated. To set up the information applied model for discretionary temperature forecast point, looking at records are gathered by means of tests (Rajmanova et al. 2015). Back Propagation neural framework is an efficient data driven exhibiting system in light of its self-learning limit. In our examination demonstrate, we utilize some of the components of five keys as the info information qualities for the introduced BP neural system show, counting the ones from surrounding condition and key limit of estimated skin temperature (Seungyong Han et al. 2018). In the proposed BP neural system, in light of the fact that the covered up layer influences the power of the neural system, it is essential to decide suitable the component quantities of the shrouded layer.

$$Q = \sqrt{m + n} + c \quad (1)$$

Where Q is the quantity of components in the shrouded layer; 'm' is the quantity of information components; 'n' is the quantity yield components; 'c' will be the scope of component quantities of the shrouded layer.

Enhanced Genetic algorithm-Back propagation Neural Network

The standard Back propagation neural system is anything but difficult to enter into the neighborhood ideal which can't accomplish the worldwide streamlining. It is important to streamline the underlying weights and

Table 1. Various Elements Number of Hidden Layer in Mean Absolute Error and Mean Percentage Error

Component number of the hidden layer	Mean absolute error (°C)	Mean Percentage error (°C)
1	1.24	1.73
2	1.20	1.71
3	1.20	1.70
4	1.24	1.76
5	1.18	1.70
6	1.15	1.65
7	1.18	1.75
8	1.19	1.76
9	1.17	1.76
10	1.18	1.76
11	1.19	1.73

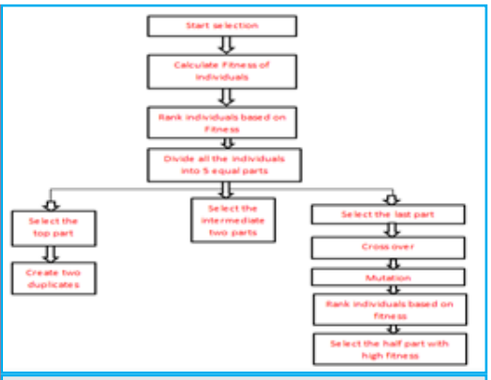

Figure 3. The best part making two copies is to enhance the people with solid match.

predisposition esteems of the Back propagation neural system Genetic algorithm has a solid large scale seek capacity and worldwide advancement execution (Y.G. Melody et al. 2015). It includes significant advances including arbitrary age of a populace, choice of people from the present populace to create the people to come, adjustment of a populace of singular arrangements by methods for hybrid and change, and assessment of wellness work . In this manner, we make strides the preparation of BP organize by beginning with GA. At that point, the BP organize begins the operation process with the better introductory weights and predisposition esteems

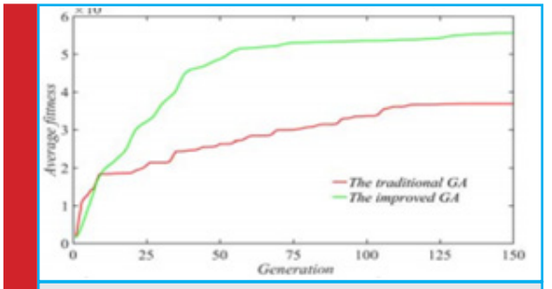

Figure 4. Improved GA and traditional GA.

gave by Genetic algorithm and methodologies the ideal arrangement (Vijayprasath et al. 2015).

The marvel of untimely combination appears in two viewpoints: 1) All the people in populace are caught at the same outrageous esteem and stop to develop; 2) the people moving toward the ideal arrangement are constantly disposed of; and the transformative procedure isn't merged.

$$f = 1 / E \quad (2)$$

We utilize the enhanced choice to supplant the conventional determination. 1) The enhanced choice builds the quantity of people with great wellness in the populace productively. 2) The people with low wellness can be chosen to the cutting edge after hybrid and change.

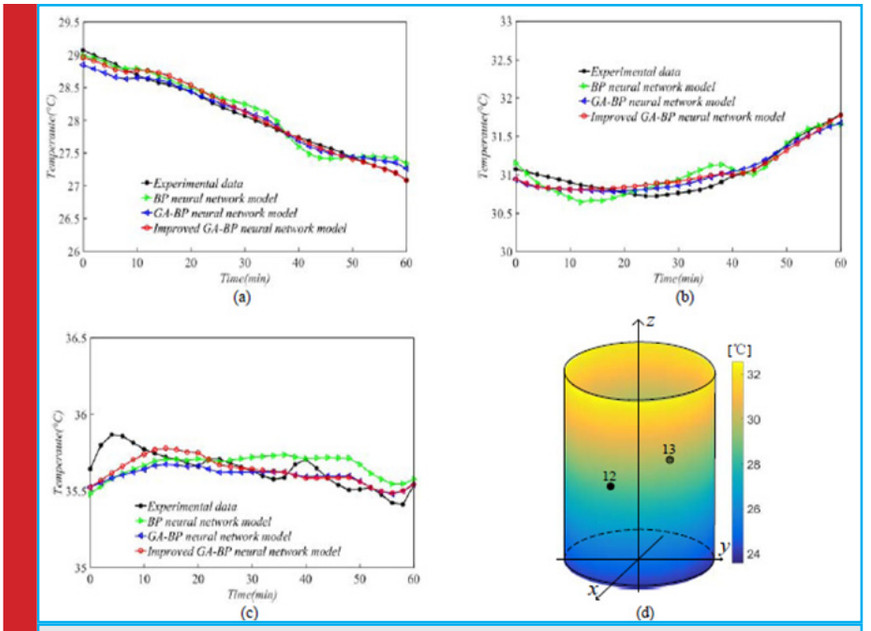

Figure 5. Results of human calf. Correlation of tentatively estimated temperature by three systems in (a) cool situation; (b) warm nonpartisan condition; (c) heat condition. (d) Temperature mapping of human calf in real-time.

Table 2. Wearable estimation framework for skin temperature and setting upmodel.

Testing enviornment	Models	Standards	
		MAE (°C)	MPE (°C)
Cold enviornment	BP NN	0.23	0.56
	GA-BP NN	0.17	0.75
	Improved GA-BP NN	0.10	0.30
Thermal neutral enviornment	BP NN	0.22	0.32
	GA-BP NN	0.11	0.31
	Improved GA-BP NN	0.05	0.20
Warm enviornment	BP NN	0.11	0.43
	GA-BP NN	0.10	0.45
	Improved GA-BP NN	0.10	0.26

TABLE II IMPROVISED ROULETTE WHEEL ALGORITHM

Calculation Improvised Roulette wheel determination

Stage 1. A category of people in plunging request as indicated by the wellness estimation of every person in the populace.

Stage 2. Partition the populace into five a balance of in the wake of arranging people.

Stage 3. Select the general population with the most vital health regards in the primary 1/5 degree and make two more duplicates, that is, the two duplicates are decided to the general population to come; Select the medium assessed 2/5 degree of the wellbeing regards to the accompanying age; After half breed and change of the general population with wellbeing regards in the line of the 2/5 extent, a category of people in new slipping solicitation and select the 1/2 degree with the wellbeing regards to the general population to come.

RESULTS AND DISCUSSION

Analysis and information collection

The temperature of the estimation centers and the self-confident foreseeing centers has a nonlinear relationship in assorted incorporating circumstances.

CONCLUSION

In this paper, set up a human skin temperature mapping organized by data driven model for coursed optical strands and upgraded Genetic algorithm-Back propagation neural framework. The proposed procedure is prepared for increasing body temperature mapping by fundamentally assessing a couple average spotlights on human skin. Remembering the ultimate objective to endorse the model, consider the lower arm and measure the temperature of a skin in normal core interests. The preliminary outcomes are utilized to favor the model in three unmistakable encompassing circumstances. Moreover, the relationship between the perceptive results gotten by model and the results by Back propagation neural framework and Genetic algorithm-Back propagation neural framework is excessively driven. The results describe the temperature is of 0.40°C and the precision of the model method is looked at a scope of circumstances.

REFERENCES

Garami, Székely. M (2014) Body temperature, Temperature,vol. 1, no. 1, pp. 28-29.

Hasselberg, M. J., Mcmahon J, and Parker K (2013) The legitimacy, dependability, and utility of the iButton® for estimation of body temperature circadian rhythms in rest/wake look into, Sleep Medicine, vol. 14, no. 1, pp. 5.

Kenny, G.P., R.J. Sigal, and Mcginn R (2016), Body temperature direction in diabetes,Temperature, vol. 3, no. 1, pp. 119-145.

Lahiri, S. Bagayathiappan, Jayakumar T, Philip J (2012), Therapeutic utilizations of infrared thermography: An audit, Infrared Physics and Technology, vol. 55, no. 4, pp. 221-235, 2012.

McCallum, Louise, and D. Higgin (2012)s, Estimating body temperature, Nursing times, vol. 108, no. 45, pp. 20-22.

Mohanapriya S, Vadivel M (2013), Automatic retrival of MRI brain image using multiqueries system, 2013 International Conference on Information Communication and Embedded Systems (ICICES), INSPEC Accession Number: 13485254, Electronic ISBN: 978-1-4673-5788-3, DOI: 10.1109/ICICES.2013.6508214, pp. 1099-1103.

Palanivel Rajan S, Kavitha V (2017), Diagnosis of Cardiovascular Diseases using Retinal Images through Vessel Segmentation Graph, Current Medical Imaging Reviews (Bentham Science Publisher), Online ISSN No.: 1875-6603, Print ISSN No.: 1573-4056, Vol. No.: 13, Issue: 4, pp. 454-459, (Impact Factor–0.613).

Palanivel Rajan S, et al. (2015a), Visual and tag-based social image search based on hypergraph ranking method, IEEE Digital Library Xplore, ISBN : 978-1-4799-3835-3, INSPEC Accession Number: 14916051, DOI : 10.1109/ICICES.2014.7034079.

Palanivel Rajan S, Dinesh T, (2015b) Systematic Review on Wearable Driver Vigilance System with Future Research Directions, International Journal of Applied Engineering Research, ISSN : 0973-4562, Vol. 10, Issue No.1, pp. 627- 632.

Palanivel Rajan S, Sukanesh R (2013), Experimental Studies on Intelligent, Wearable and Automated Wireless Mobile Tele-Alert System for Continuous Cardiac Surveillance, Journal of Applied Research and Technology, ELSEVIER, ISSN No.: 1665–6423, Vol. No. 11, Issue No.: 1, pp. 133-143.

Palanivel Rajan S, Dinesh T (2015c), Statistical Investigation of EEG Based Abnormal Fatigue Detection Using LabVIEW, International Journal of Applied Engineering Research, ISSN: 0973-4562, Vol. 10, Issue 43, pp. 30426-30431.

Palanivel Rajan S, K Sheik Davood (2015d), Performance evaluation on automatic follicles detection in the ovary, International Journal of Applied Engineering Research, Vol. 10, Issue 55, pp.1-5.

Rajmanova P, Nudzikova, Vala (2015), Application and innovation of warm envision camera in prescription, IFAC-PapersOnLine, vol. 48, no. 4, pp. 492-497.

Seungyong Han, Jeonghyun Kim (2018), Jeonghyun KimBattery-free,wireless sensors for full-body pressure and temperature mapping

Y.G. Melody, H.W. Yu, S.H. Park, M.H. Ko, J.H (2015). Website optimization, Changes in body temperature in inadequate Spinal Cord Injury by computerized infrared thermographic imaging, Annals of Rehabilitation Medicine, vol. 39, no. 5, pp. 696-704.

Palanivel Rajan S, (2015e) Review and Investigations on Future Research Directions of Mobile Based Telecare System for Cardiac Surveillance, Journal of Applied Research and Technology, ISSN No.: 1665–6423, Vol. 13, Issue 4, pp. 454-460, 2015

Vijayprasath S, Palanivel Rajan S (2015) Performance Investigation of an Implicit Instrumentation Tool for Deadened Patients Using Common Eye Developments as a Paradigm, International Journal of Applied Engineering Research, ISSN: 0973-4562, Vol.10, No. 1, pp. 925-929.