iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** VIII **Month of publication:** August 2017

DOI: http://doi.org/10.22214/ijraset.2017.8057

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue VIII, August 2017- Available at www.ijraset.com

An Implementation of Non-Contact Respiratory Monitoring System with Advanced Nasal-Mandible Tracking Algorithm with Roi

Pawandeep Kaur Dhaliwal[1], Er. Harpreet Kaur Chahal[2]
[1,2] Electronics & Communication Department, Guru Gobind Singh College of Engg. And Technology, Guru Kashi University

Abstract: ***Respiratory sound can be measured using a microphone placed either close to the respiratory airways or over the throat to detect the variation of sound. Then a frequency analysis and estimation of the loudness of the sound can be carried out. A respiratory sounds measurement system to detect sleep apnea in infants. The system depended on recording a signal derived from breathing sounds from the nose. This method was applied to eight premature infants. Snorting, speaking, crying, coughing etc had a negative effect on the operation of the system. A problem with airflow measurement is that some patients may not feel comfortable with the sensor. The collector can also affect respiratory activity by increasing dead space. The existing method worked well when the subject breathed through the nose (not mouth) and the mouth remained closed. The Non-Contact Respiratory Monitoring System with advanced nasal-mandible tracking algorithm along with ROI. In this work the Inspiration, Expiration, Respiratory rate and Pulse rate values are calculated. The existing mean value 2.4 and 78.1 and the proposed value is 9.7 and 81.3.***
Keywords: ***ROI, Respiratory rate, Pulse Rate, Expiration Rate, Wireless Mensuration.***

I.INTRODUCTION

Monitoring of breathing function has applications among others in polygraph, sleep studies, sport training, early detection of sudden infant death syndrome in neonates, and patient monitoring.

Various contact measurement methods have been developed for estimating the breathing rate of a subject. George B. Moody, et al. developed a contact modality in which numerous Electrocardiogram (ECG) electrodes and sensors are attached to the subject [1]. The principle of operation is based on the fact that the heart rate is typically modulated by breathing, a phenomenon known as sinus arrhythmia [2]. Therefore, a signal corresponding to the heart function contains breath information, which is filtered out using band-pass filters.

As an improvement over the ECG method, the BioMatt method [3] was developed in Finland by a group of researchers who were studying sleep disorders. BioMatt performs measurements of vital signs, such as breathing and cardiac activity without electrodes. Initially, BioMatt could not distinguish motion that was due to breathing versus cardiac activity or body movement. Later, Larson developed a signal processing technique to separate out the components of the BioMatt signal [4].

Photo plethy smography (PPG) is a variant method of the ECG, developed to measure blood volume changes in living tissues by absorption or scattering of near-infrared radiation. This modality consists of an infrared Light Emitting Diode (LED) and a photodiode which can be clamped to the ear lobes, thumbs, or toes. It is advantageous in that it is portable, compact, and needs very little maintenance. The measurement of blood volume changes by PPG depends on stronger absorption of near-infrared light by blood when compared to other superficial tissues [5]. The amount of backscattered light corresponds to the variation of the blood volume. As in ECG, the breath waveform is separated from the cardiac signal through various methods that have been developed [6], [7]. However, using heart function as a basis for acquiring the breathing waveform is unreliable since sinus arrhythmia is not present in all individuals. Control of cardiac activity by breathing depends on the age and medications administered to subjects.

Other contact modalities are capable of measuring directly the breathing signal. An example of such modality is the abdominal strain gauge transducer [8] that is strapped around the subject's chest and measures the change in thoracic or abdominal circumference while breathing. Another example is a thermistor measuring nasal air temperature variation as an indication of breathing [9].

II.CHEST AND ABDOMINAL MOVEMENT DETECTION

Chest and abdominal wall movements can best be measured by either mercury strain gauges or impedance methods. Respiratory inductance plethysmography is a non-invasive technique whereby two bands measure the respiration rate, the thoracic band which

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue VIII, August 2017- Available at www.ijraset.com

is placed around the rib cage and the abdominal band which is placed over the abdomen at the level of the umbilicus. The bands are made from an extendible/deformable conducting material, either a very fine wire or thin foil such that the conductivity can be maintained during the stretching process [2, 5].

The principle of the strain gauge sensor is based on increase in the resistance of a conductor when the area of the conductor is increased during the respiration process. Normally the inspiratory thoracic and abdominal expansion is almost synchronous. However, if the upper airway is partially obstructed, there may be a change in the phase angle and timing of the movements of the thorax and abdomen[6] . The movements become asynchronous, ie the thorax moves inwards, and the abdomen outwards. During expiration this pattern is then reversed. Thoraco-abdominal asynchrony is a normal finding in infants in whom chest wall compliance is greater [7] and is exacerbated by respiratory disease or respiratory muscle weakness [8].

III.HEALTH AND ACTIVITY MONITORING SYSTEMS

Increasing demand on public healthcare services due to the aging population has become a major problem in developed and underdeveloped countries. In parallel with the advances in ubiquitous computing technologies, extensive research is being carried out in using sensor networks and automated healthcare systems for home and hospital care environments [6]. There are various related healthcare monitoring and information technology systems working to solve the problems of healthcare delivery which utilize many of the vital signs sensing techniques discussed in the previous section.

MEDiSN is an emergency room monitoring system. In hospital scenarios, there are large groups of patients requiring medical treatment. However, due to limited hospital capacity, priority of treatment must be determined and assigned.

MEDiSN is a system that assists doctors, nurses and caregivers with calculating triage according to patients‟ vital signs. A similar system could be deployed in an assistive living facility and combined with non-contact sensing techniques to monitor elderly residents.

New born infants are also highly susceptible to illness and infection, but one of the leading causes of infant mortality is Sudden Infant Death Syndrome (SIDS). SIDS strikes without warning causing unexplained deaths in infants from one month to one year of age. The SleepSafe system [8] uses infant clothes-embedded SHIMMER sensor nodes and another base station to detect an infant‟s sleeping position and reduce the risk of sudden death. Baby Glove [8] is another solution to monitor infant health and encompasses two integrated sensor plates which contain a thermostat temperature sensor, along with electrodes that monitor the child‟s pulse rate and hydration. The system monitors the vital signs information from sensors via a data acquisition module, organizes the measurements into packets, and transmits them wirelessly to the second mote connected to the base station computer for processing.

IV.STEREOSCOPIC METHODS OF RESPIRATORY MONITORING

Stereoscopic system contains two or more cameras that capture video of the same scene from different locations. It is possible to estimate distance to the object using the system demonstrated in Fig. 1.5. Depth of 3-D image is directly proportional to focal length of camera lense f and distance between cameras optical axes b , and inversely proportional to disparity of the same object point in pixels d : $depth = f \times (b / d)$. The points of object for different images of the same scene should be robustly identified for correct 3-D reconstruction.

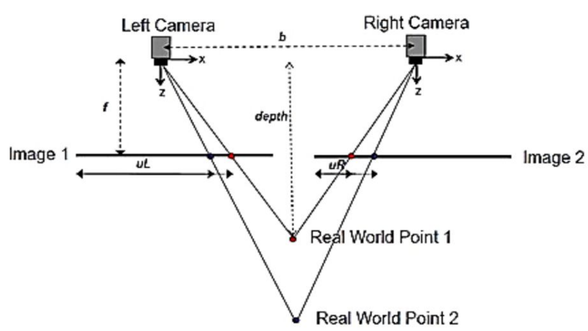


Fig. 1 Stereoscopic system [1]

V.METHODOLOGY

This research work is to compress the color images. It is based upon GUI (graphical user interface) in MATLAB. It is an effort to further grasp the fundamentals of MATLAB and validate it as a powerful application tool. There are basically different files.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue VIII, August 2017- Available at www.ijraset.com

Each of them consists of m-file and figure file. These are the programmable files containing the information about the images. The work is to implement Non-Contact Respiratory Monitoring System Using Thermal Image Processing with the help of new algorithm. The Measurement of physiological information is the primary and most important task for our proposed system.

The proposed steps are given below:

Step 1: Set the camera and appratus .

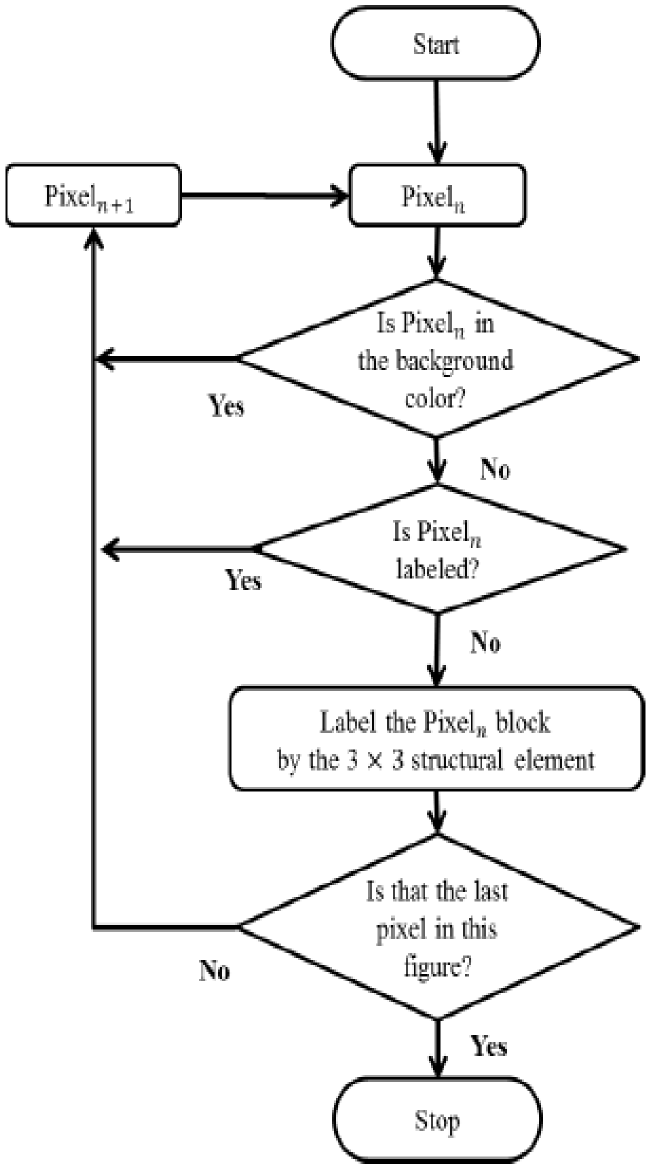
Step 2: Apply the preprocessing for image reading .

Step 3: Apply the algoritm for RMS.

Step 4 : Apply morphological operators for noise removel .

Step 5: Get the prameters respiration rate and other parameters.

The processing flow of connected component labeling



VI.RESULT

In the research work the different snap shorts are displayed with different respiration wave signals and Camera. These snap shorts are given below:

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue VIII, August 2017- Available at www.ijraset.com

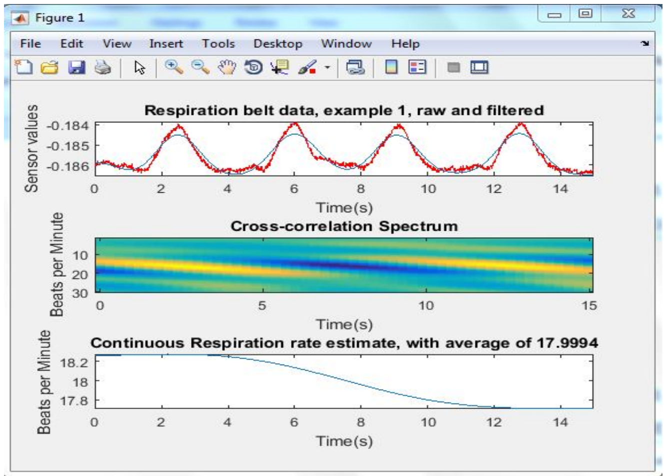


Fig. 2 Respiration belt data with average 17.9994

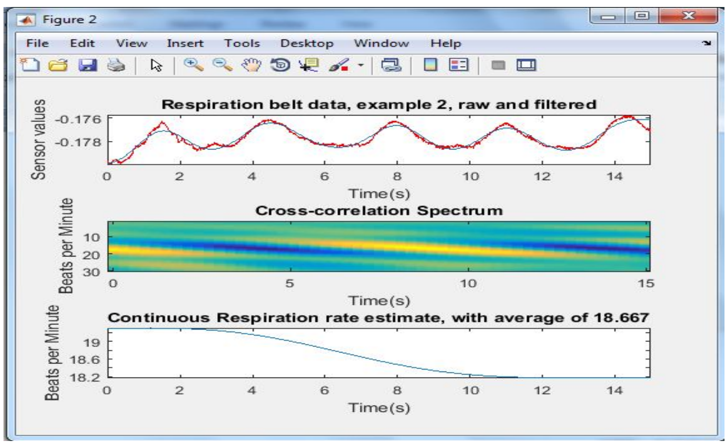


Fig. 3 Respiration belt data with average 18.667

The figure 2 and the figure 3 is the processing of respiration belt with different average. It displays the cross correlation spectrum and continuous respiration rate estimation.

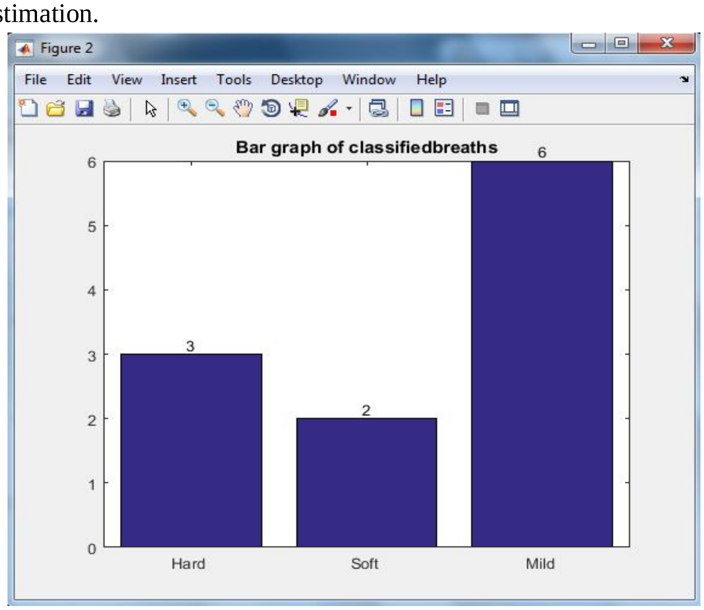


Fig. 4 Bar Classification of breath on 1.wav signal

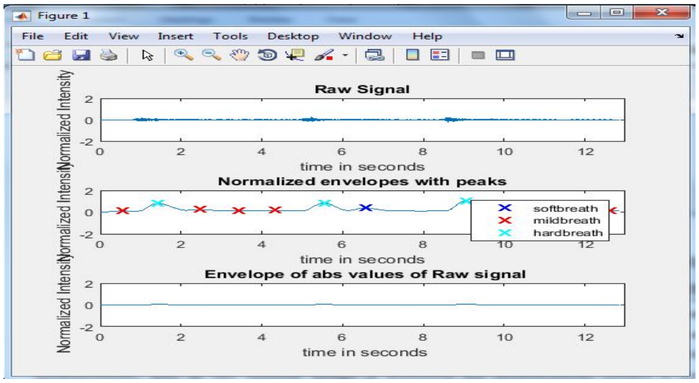


Fig. 5: 1.wav breath signal processing

The figure 4 and the figure 5 displays the 1.wav signal processing with soft ,mild and hard breath . it displays the different wave signals that is displayed in the figure.

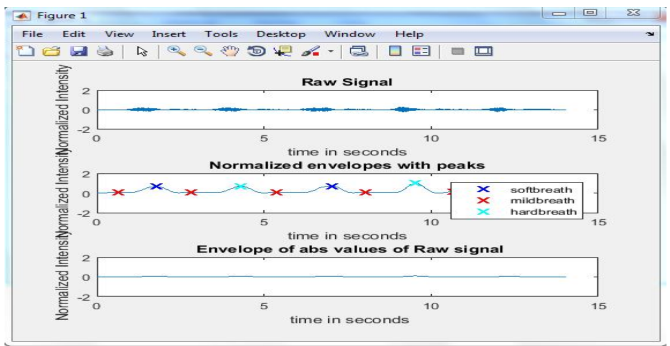


Fig. 5: 2.wav breath signal processing

Existing Work

Breath in the hold respiration pattern				
Sample number	Thermal image processing			Photoplethysomgraphy
	Inspiration (Times)	Experation (times)	Respiratory rate (breaths/min)	Pulse rate (bpm)
1	2	2	2	73
2	2	2	2	72
3	2	2	2	71
4	2	2	2	74
5	2	2	2	73
6	2	2	2	84
7	3	3	3	80
8	2	2	2	86
9	3	3	3	84
10	4	4	4	84
Mean	2.4	2.4	2.4	78.1

Proposed Work

Breath in the hold respiration pattern				
	Thermal image processing			Photoplethysomgraphy
Sample number	Inspiration (Times)	Experation (times)	Respiratory rate (breaths/min)	Pulse rate (bpm)
1	6	6	6	78
2	6	6	6	75
3	6	6	6	74
4	6	6	6	78
5	6	6	6	75
6	6	6	6	86
7	20	20	20	85
8	6	6	6	90
9	20	20	20	86
10	15	15	15	86
Mean	9.7	9.7	9.7	81.3

VII.CONCLUSION & FUTURE WORK

In this respiration watching system, we have a tendency to specialize in thermal imaging process, build this technique ready to settle for the movement of a subject matter among a precise vary and distance. and therefore the most significant half is that the system has the feature of wireless mensuration, and because the thermal image is quiet the mensuration results is a lot of obvious, and a lot of correct regarding metabolic process undulation. Besides, we have a tendency to divide respiration into 3 patterns for information aggregation throughout the experiment. they're traditional metabolic process pattern and deep metabolic process pattern and hold metabolic process pattern. The results of the experiment works with success. The undulation clearly discovered the metabolic process standing. In distinction, since the system is wireless mensuration, it's plenty of noise that require to be excluded. particularly owing to the state of once motion, subject's skin surface sweat glands the warmth and as a consequence, the temperature of every skin surface block is comparatively unstable. there's scenario that causes difficulties in measurements, that's the pattern of the speedy respiration. In my opinion, the rationale there's such scenario is that the frequency is just too high and therefore the sample rate is tiny, inflicting the signal is commonly considered noise. All and every one, the system is sort of appropriate for respiration undulation detection. In this work the Inspiration, Expiration, Respiratory rate and Pulse rate values are calculated. The existing mean value 2.4 and 78.1 and the proposed value is 9.7 and 81.3.

In the future the respiration system is extended with the help of micro chip and the signal processing with the help of different operators and algorithms. It is further classified with the help of real time database.

REFERENCES

[1] Ta-Chi,Chiang et.al. "The Non-Contact Respiratory Monitoring System Using Thermal Image Processing" 3rd International Conference on Green Technology and Sustainable Development , 2016
[2] Alkali, Abd et.al. "Thermal Image Processing for Real-Time Noncontact Respiration Rate Monitoring" Sheffield Hallam University Research Archive (SHURA) at 2016.
[3] Karthik Mohan Rao et.al. "A Review On Different Technical Specifications Of Respiratory Rate Monitors" IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 , Volume: 04 Issue: 04 | Apr-2015.
[4] Farah AL-Khalidi et. al. " Respiratory Rate Measurement in Children Using a
[5] Thermal Imaging Camera" International Journal of Scientific & Engineering Research, Volume 6, Issue 4, April-2015
[6] Farah Q Al-Khalidi et. al. "Respiration Rate Monitoring Methods: A Review" John Wiley & Sons, Inc.,2011
[7] R. Murthy et.al. "Non-Contact Monitoring Of Breathing Function Using Infrared Imaging" Department of Computer Science University of Houston , April 09, 2005.

[8] Hamed Monkaresi, Rafael A. Calvo, and Hong Yan, “A Machine Learning Approach to Improve Contactless Heart Rate Monitoring Using a Webcam”, IEEE Journal of Biomedical and Health Informatics, .vol.17, No.9, pp.187-199

[9] Lee Seng Yeong, Ang, Li-Minn, Kah Phooi Seng, “Efficient connected component labelling using multiple-bank memory storage”, Computer Science and Information Technology (ICCSIT), 2010 3rd IEEE International Conference, vol.9, pp.75-79, 9-11 July 2010.

[10]D.A. Socolinsky and A. Selinger, “A comparative analysis of face recognition performance with visible and thermal infrared imagery”. In Proceedings of 16th International Conference on Pattern Recognition, vol.4, pp. 217–222, Quebec, Canada, 2002.

[11]Fida’ Al-Obaisi, Ja’far Alqatawna, Hossam Faris, Ali Rodan, Omar Al Kadi, “Pattern Recognition of Thermal Images for Monitoring of Breathing Function”, International Journal of Control and Automation, Vol. 8, No. 6 (2015), pp. 381-392.

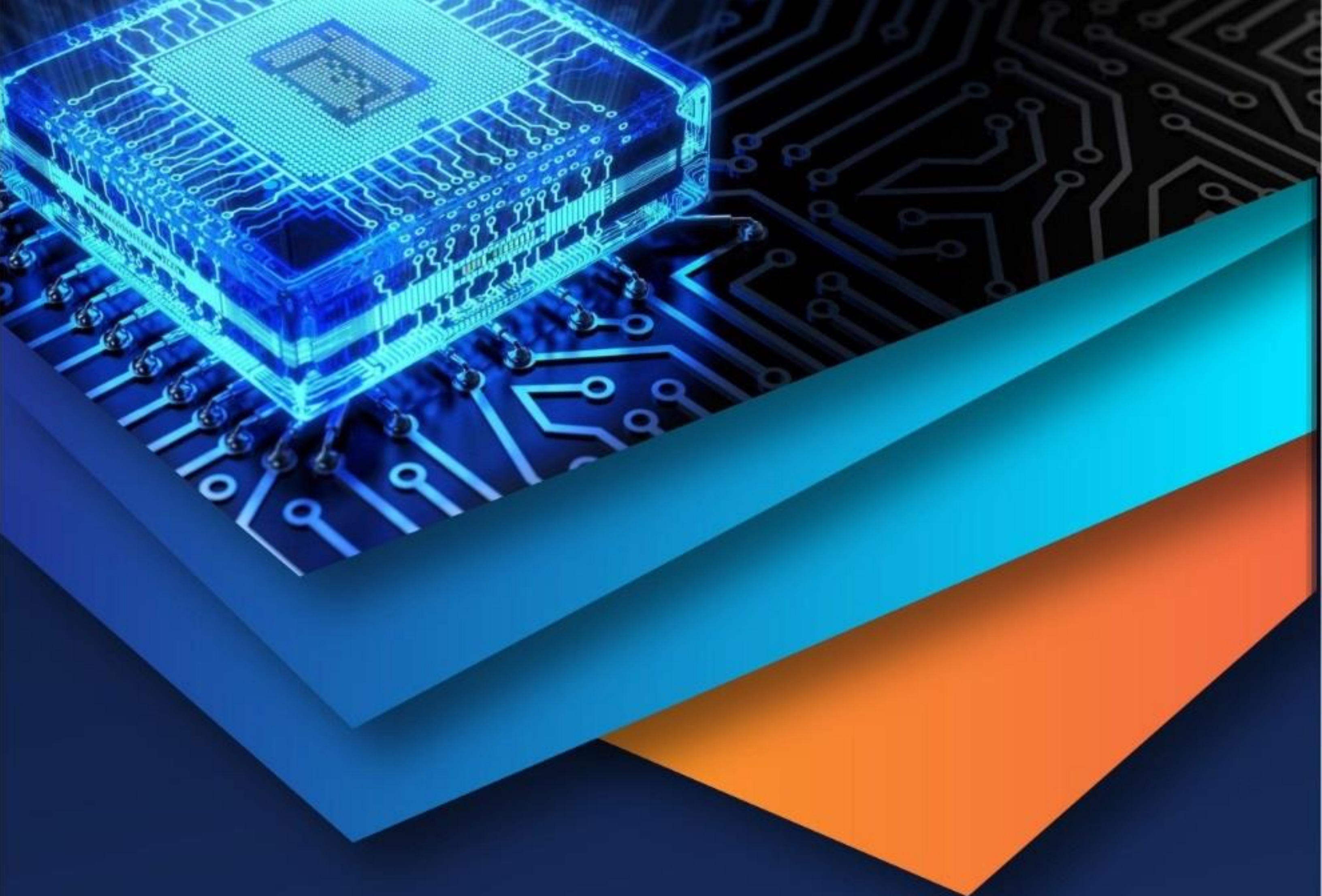
[12]Carina Barbosa Pereira, Xinchi Yu, Michael Czaplik, Rolf Rossaint, Vladimir Blazek, Steffen Leonhardt, “Remote monitoring of breathing dynamics using infrared thermography”, biomedical optics express 4382, 2015 Optical Society of America, published Oct 16, 2015.

[13]Zhou, Y., Tsiamyrtzis, P., Lindner, P., Timofeyev, I. and Pavlidis, I.: 'Spatiotemporal smoothing as a basis for facial tissue tracking in thermal imaging', IEEE Transaction on Biomedical Engineering, 2013, 60, (5), pp. 1280-1289.

[14]Edelman, G.J., Hoveling, R.J., Roos, M., van Leeuwen, T.G., and Aalders, M.C.: 'Infrared imaging of the crime scene: possibilities and pitfalls', J. Forensic Sci., 2013, 58, (5), pp.1156-1162.

[15]Murthy, J.N., van Jaarsveld, J., Fei, J., Pavlidis, I., Harrykissoon, R.I., Lucke, J.F., Faiz, S. and Castriotta, R.J.: 'Thermal infraed imaging: a novel method to monitor airflow during polysomnography', Sleep, 2009, 32, (11), pp. 1521-1527.

[16]Mostafa, E., Farag, A., Shalaby, A., Ali, A., Gault, T. and Mahmoud, A.: 'Long term facial parts tracking in thermal imaging for uncooperative emotion recognition', IEEEXplore, 2013,



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY