HEART BEAT SENSOR USING FINGERTIP THROUGH ARDUINO

P. Srinivasan¹, A. Ayub Khan², T. Prabu³, M. Manoj⁴, M. Ranjan⁵, K. Karthik⁶

¹Assistant Professor, Department of ECE, Sona College of Technology, Salem, India. ²Assistant Professor, Department of ECE, Sona College of Technology, Salem, India. ³Department of ECE, Sona College of Technology, Salem, India. ⁴Department of ECE, Sona College of Technology, Salem, India. ⁵Department of ECE, Sona College of Technology, Salem, India. ⁶Department of ECE, Sona College of Technology, Salem, India.

Received: 16.02.2020    Revised: 04.03.2020    Accepted: 08.04.2020

Abstract
Heart is the most wanted part of human being to live in a world, at the same time the heart rate analysis is increased in medical field and the heart analysis is important parameter of human health. The various heart rate analysis method is available in medical field like ECG and pulse sensing system this pulse analysis is depends on the blood force of heart artery. This artery is closed to the skin in that reason the pulse is identified easily. The proposed system analyse the pulse rate in the way of fingertip using Arduino controller, and it’s based on photo phelthysmo graphy principle. This method to analysis the blood pressure difference and identified the variations of the value of blood pressure and send to the controller. The function of heart beat analysis is to detect the whole body blood is pumping, so it depends upon the fingertip blood artery is also change. This type of changes is identified with help of the heart beat sensor placed in the finger to measure the value, and the signal is send to the controller via serial communication system it is help to monitoring the heart beat range. The photo diode and infra-red led is placed to the sensor to detect the blood volume, the infrared diode is transmit the infrared light to the fingertip, this light passing over the blood inside arteries of finger. The photo diode is analysis the light signal and reflected back to the device, so the difference between the light signal the value is send to the controller. It is continuously processed in the every circulation of blood in the fingertip region, and send the variation of changes in the light signal to the controller via serial communication. The reflected light is converted into the pulse range to easily identify the heart beat range.

Keywords: Heart Beat Sensor, Heart Beat Range, Serial Communication.

INTRODUCTION
In recent year the mortality rate is increased through the heart attack is occurred in the human being, so the heart rate analysis is very important to reduce the mortality rate in the world. The heart rate is monitoring with help of the real time sensors like heart beat sensor is used to fix on human chest and monitor every seconds, and the sensed data is send to the controller if any variation occur in the data the alert signal is send to the medical person. The heart rate is varied with respect to the human age, like the normal person having 72 bpm (beats per minute), the aged person having 90 bpm and the child having 120 bpm. In that heart rate is increasing when the human doing an exercise and the rest of the time it is going to a normal condition, but the heart rate is lower when compared to the normal range is called has a bradycardia and higher range is called as tachycardia. The heart rate analyser is compared to the human fingertip to counting the pulse over every 30 seconds and the signal given to the controller. In existing methods the analysed data is multiple by 2 because it have more error, many type of electronic device is measure the heart rate like ECG but the cost of this device is high. The low cost device is available in the wristwatch type is measure the temperature also, so this type of device is efficient and cost effective.

EXISTING METHODS
There have been many methods developed in order to ensure that the heartbeat rate of a human is under control. All these methods have the similar drawback of accuracy. It can cause a life to death. To overcome this many methods have been proposed in this field as follows:
- A paper on "FINGERTIP BASED HEART BEAT MONITORING SYSTEM USING EMBEDDED SYSTEMS" got published in 2017 where the heart beat rate is counted based on the ECG device.
- A paper on “SMART HEART RATE MONITORING SYSTEM” predicts the heart rate using infrared transmitter and receiver circuits where Photo-Plethysmography (PPG) implemented.
- Another paper on "ARDUINO BASED WIRELESS HEART-RATE MONITORING SYSTEM WITH AUTOMATIC SOS MESSAGE AND/OR CALL FACILITY USING SIM900A GSM MODULE" uses Arduino Lilypad as the main governing microcontroller to transmit circuit wearable.

DISADVANTAGES
- The people who suffer from heart disease in case if there is any change in heartbeat rhythm they can’t feel anything in our body.
- But in the beginning we can’t feel the change in heartbeat rhythm when it goes severe then it will create a pain which leads to heart attack.
- The people who got a sever attack they will be unable to think about their health and at last it may lead to death of the affected person.

PROPOSED METHOD
The proposed system is based on the working of infrared light is passing to the blood value and analysis the heart rate. In this device is placed on the human fingertip and measure the heart rate through heart beat sensor and send the signal to the controller and GSM. First the sensor is fix into the human fingertip the blood is circulated to the fingertip at the time sensor infrared light is passing to the photo diode via blood value to measure the blood pressure and this measured value is given to the arduino controller. The controller analysis the sensed value and threshold value if any difference occur in the output.
the controller send the signal to user via GSM, also the arduino controller display the value of sensor output in the LCD display. The heart beat sensor having the photo diode and IR sensor, the working of this sensor is IR passed to the finger one side and the photo diode is receiving the signal and measure the pulse, blood count for 30 seconds. The intensity of the blood is decrease and increase is respect to the heart rate, so easily found the heart is normal or abnormal. The sensor measure value is converted into the voltage variation respect to the op-amp function and the output value is given to the controller in DC voltage from. The communication of this heart analysis system is using the GSM module, this module send the data through the user mobile in the range of 850MHz to 1900MHz frequency band of this proposed system communication.

RESULT
In this monitoring system, based on the rate of our heart beat, our heart condition is divided into 3 levels such as low heart rate level, normal heart rate level, high heart rate level. The below table has the results of the difference in heart beat of a person at difference instance of time. It is found that the heart beat is high after a workout, low during depression and normal when sleeping. Thus it can measure the heart rate of a person.

| HEART RATE PER SECOND | CONDITION |
|-----------------------|-----------|
| 58                    | LOW RATE  |
| 72                    | NORMAL RATE |
| 150                   | HIGH RATE |
| 90                    | NORMAL RATE |
| 55                    | LOW RATE  |
| 140                   | HIGH RATE |

CONCLUSION
The proposed system contains the infrared sensor and photo diode, the various heart rate data is analysed to this system. The objective of this proposed system is operating in faster and accurate data is given to the controller and user, this system helps to monitor the patient health condition via GSM to the medical persons. The prototype project is developed to monitor the patient health if any changes is occur in the sensor value the signal is send to controller, this controller give the signal to the user via GSM module. The use of the proposed system is measure the patient health in every seconds and the data is noted to the record, so the patient is no need to go to the hospital in more time. If the heart attack occur in the patient side the message is pass through the mobile to the doctor, and this is done though a comparison of sensor value and threshold value if any variation is occur to alert the user. Also the monitoring of the patient is available in everywhere so it is more helpful in rural areas user, and the proposed system is given the accurate value and faster operation of this system.

FUTURE SCOPE
The improvement of the proposed system performance is enhanced in future work:

- Design the system is implemented to efficient measuring and the reduction of noise in the output of the communication system. Also to implement the design of controller and GSM module like transmission efficiency.
- To implement the device accuracy is done on various people in different ages and more testing is taken to the system is developed.
- The temperature sensor is also implemented in the system like the LM35 is used to measure the body temperature and given to the controller for accurate operation.
- In future more health parameters are find patient and monitor in single device is implemented, so the time is save and identify more problems in patient health.
- The pulse measurement is implement to the patient is very important to take a action in very short period, this is help to rescue the patient in quick way.
- The controller is given the signal to mobile via GSM module to alert a user and also the GPS is implemented is used to easily find the location of patient area.
- This proposed system is implemented in the minimizing of the PCB space is very useful to wear the sensor in patient body.
- The proposed system kit is implemented to inbuilt battery is useful to wear in long distance.
REFERENCES

1. Matina Kiourexidou, Konstantinos Natsis, Panagiotis Bamidis, Nikos Antonopoulos, Eftymia Papathanasiou, Markos Spantzos, Andreas Veggis "Augmented Reality for the Study of Human Heart Anatomy" International Journal of Electronics Communication and Computer Engineering 2015.

2. Souvik Das "The Development of a Microcontroller Based Low Cost Heart Rate Counter for Health Care Systems" International Journal of Engineering Trends and Technology-Volume4Issue2-2013.

3. Embedded Lab. Introducing Easy Pulse: A DIY photoplethysmographic sensor for measuring heart rate. http://embedded-lab.com/blog/?p=5508, 2012.

4. Sankar Kumar S, Gayathri N, Niveditha D, Priyanka A S "A Cost effective Arduino Module for Bedridden patient's Respiratory Monitor and Control" International Journal of advanced research trends in engineering and technology (IJARTET) VOL. II, SPECIAL ISSUE XXI, MARCH 2015.

5. Ch.Sandeep Kumar Subudhi,Intelligent Wireless Patient Monitoring and Tracking System (Using Sensor Network and Wireless Communication), 2014.

6. Bhagya Lakshmi.J,M1 Hariharan.R2 Udaya Sri.C3 Nandhini Devi.P4 Sowmiya.N "Heart Beat Detector using Infrared Pulse Sensor" IJSRD - International Journal for Scientific Research & Development Vol 3, Issue 09, 2015.

7. Nazmus Saquib, Md. Tarikul Islam Papon, Ishtiyaque Ahmad, and Ashikur Rahman "Measurement of Heart Rate Using Photoplethysmography".

8. Embedded Lab. PC-based heart rate monitor using Arduino and Easy Pulse sensor. http://embeddedlab.com/blog/?p=7485, 2013.

9. R. Raj and S.J. Jothi. Estimation of Heart Rate from Photoplethysmographic Signal Using SVR Method. The International Journal of Science & Technology, Volume 2, Issue 2, 2014.

10. Hashem et al, ―Design and Development of a Heart Rate Measuring Device using Fingertip‖, IEEE International Conference on Computer and Communication Engineering (ICCCE), ISBN: 978-1-4244-6235-3, 2010.

11. Embedded Lab "Arduino measures heart beat rate from fingertip"

12. Sagar C. Chhatrala, Mitul R. Khandhedia” Ubiquitous Physiological Monitoring of SPO2& Heart Rate” International Journal for Research in Technological Studies Vol 1, Issue 2, January 2014

13. Ufaroh S.U, Oranugo C.O, Uchechukwu M.E “Heartbeat monitoring &alert system using GSM technology” International Journal of Engineering Research and General Science Volume 3, Issue 4, July-August, 2015

14. Heartbeat checking and ready framework utilizing GSM innovation, Ufaroh S.U, Oranugo C.O, International Journal of Engineering Research and General Science Volume 3, Issue 4, July-August, 2015 ISSN 2091-2730.