Contact-less Temperature & Heart Rate Measuring for Medical Application

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ABSTRACT -This paper describes the development of a contact-less temperature and heart rate measuring system. In recent years, much attention is being paid to research and development of technology that provides contact-less measurement of vital signs for example heart rate, body temperature and respiration, which are important for understanding the state of a person's health. The paper consists of sensors which measures heart rate and body temperature of a patients which is controlled by Arduino. Both the readings are displayed in the LCD display or monitor. The pulse sensor counts the heart beat for specific interval of time and the temperature sensor measures the body temperature. Eventually, this project provides a low cost, easily accessible human health monitor solution bringing the gap between the patients and doctors during this corona virus pandemic. There, are a few devices in the current market which can give crude clinical estimation information to patients and specialists, yet the patients may not decipher the clinical estimation into significant conclusion since they have minimal clinical foundation or knowledge. Then again, if raw clinical information is conveyed to the specialist, it kills a lot of time and may create additional problems, yet in crises time can never be squandered.

Keywords - Arduino, Body temperature, contact-less measurement, Heart rate, monitor, pulse, sensors

INTRODUCTION

Physical health is measured from the basic parameters of normal values of body's vital signs, including heart rate and body temperature. Monitoring heart rate and body temperature is very important for patients as it determines the condition of the heart and the body. Heart rate means the number of heartbeats per unit time, usually expressed as beats per minute (bpm). Heart rate can vary according to the demand of the muscles to absorb oxygen and excrete carbon dioxide changes, such as during exercise or sleep. It's also varying significantly between individuals based on fitness, age and genetics. Pulse sensor is simply a device that measures a sample of heartbeats and computes the beats per minutes so that the information can easily track heart condition. The Arduino is interfaced with the lM-35 temperature sensor to sense body temperature and a pulse sensor to read pulse or heart rate. The measured pulse or heart rate and temperature are displayed on LCD display interfaced to the Arduino. The health-related data for instance heart rate and body temperature are periodically updated and recorded and that data can be further utilized to keep medical history of the patients. Medical doctors or nurses use heart rate and body temperature for tracking of patient's physical conditions. Body temperature means measurement of the body's ability to generate and get rid of heat. It is one of chief indicators of normal functioning and wellness or health. The contact-less body temperature and heart rate monitoring system gives information of body temperature and heart rate simultaneously and sends the result to the LCD display device. In this paper, we present the design of a very low-cost contact-less patient monitoring system which measures heart rate and body temperature of a patients. The gaol of this paper is designed the low-cost device which measures the heart rate and body temperature of the patient and detecting the heart attack by putting sensor on one of the fingers that the heart rate can be measured from, and displaying the result on the LCD display and serial monitor the Arduino programmer.

LITERATURE SURVEY

The two most vital parameters for different industries related to climate are temperature and Humidity. There is a need in the advancement in the technology to measure or monitor environmental factors which are temperature, pressure and humidity. Since most of the industries have machinery sensitive to climaticcondition we need to have a system which integrates and give results. High temperatures and extremely low temperatures increase the danger of server failure and information loss, while low humidity implies the dry air will cause electrostatic release which can damage critical server components, whereas an excessive of humidity will cause condensation, resulting in hardware corrosion and breakdown. In Medical Field, observing the situation of pandemic of COVID 19 many research are going on and many of them are still working on the vaccine. We in this paper proposed an instrument which will help people segregate into 2 categories the healthy ones with normal body temperature and normal pulse rate, the other category of people having high body temperature and low pulse rate which is also likely to be the symptoms of COVID 19. The reliable measurement and checking are essential during this

competitive era of technology. Arduino, the open-source equipment has demonstrated the ability to fulfilled the necessity of accurate and realtime monitoring and controlling of environmental factors. The Arduino user community may be a discussion where huge numbers of us can share their ideas, utilize each other's work, and change them to improve and progress numerous different interacting objects. Continuous monitoring of the pulse rate and human body temperature is must in these days if we have to get to go somewhere out of the house to buy some stuffs. So this device will enable people to continuous monitor their health parameters and they can have a clear analysis of these parameters. Many researchers and techno giants are trying to make such an instrument which can monitor both temperature and the pulse rate we in this research paper have got a solution, the device we are proposing is cheap and affordable by the needy ones and is not so costly. We have used the LM35 sensor and Pulse sensor with the Arduino board and integrate all in one to make this instrument. The materials required are easily available, cheap in cost, and straightforward to use with the help of possible open-source data. After multiple tests of the instrument on human bodies we can come to a result to compose this instrument and make it available to people in market so they can afford this cheap instrument and have a access to the monitoring of the health parameters like body temperature and the pulse rate of the heart. The instrument is quite efficient in the measuring parameters and is likely to be a good techno research for the situation like the pandemic of COVID 19 which is still prevailing.

RELATED WORK

Our objective here is to reduce the cost of the most expensive materials and make it maximum cost efficient so that it can reach even the poor patient during the hard times. The circuit in the projects when powered by the battery, the pulse sensor starts sending pulse signals from human touches to Arduino. Also, ambient temperature value is sent from Arduino to LM-35 sensor. The pulse sensor has an infrared LED that detects pulses via IR and help detect heartbeat. Whenever it detects a pulse, the IR glows up and. The IR LED flash is detected by the phototransistor and its resistance changes per pulse. The average adult heart rate ranges from 60 to 100 beats per minute. The sample rate generated by Arduino to detect heart rate is 500 Hz. This sample rate is sufficient to detect any heart rate. All subsequent beats are calculated when the Analog output from the heartbeat sensor is greater than the median point i.e., 512 and 3/5 of the time between the recorded bits in the previous cycle has passed. Each time the cadence is recognized, an adaptable update is spoken to by BPM. This incentive in this factor is squeezed to similar individuals consistently and is utilized to speak to the real Beats Per Minute or pulse. Arduino code additionally utilizes capacity to give an enduring LED impact on all pieces. The desired input when it reaches the Arduino is compiled according to code and the user gets to see the desired value on the end of the LCD screen.

COMPONENTS REQUIRED

1) Pulse Sensor

2) LM-35 Sensor

3) Arduino Uno

4) 16 *2 LCD

5) Bread Board

6) 10k potentiometer

7) Connecting wires

BLOCK DIAGRAM

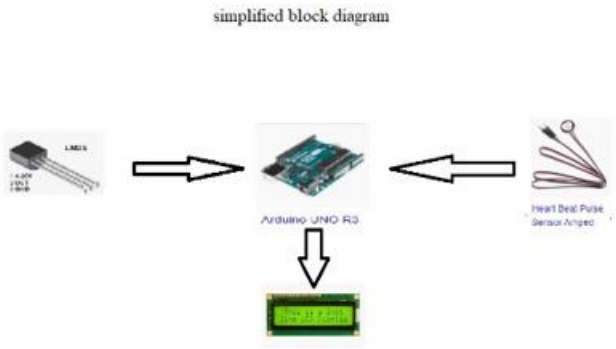

Fig.1. shows the block diagram ofproposed system

CIRCUIT DIAGRAM

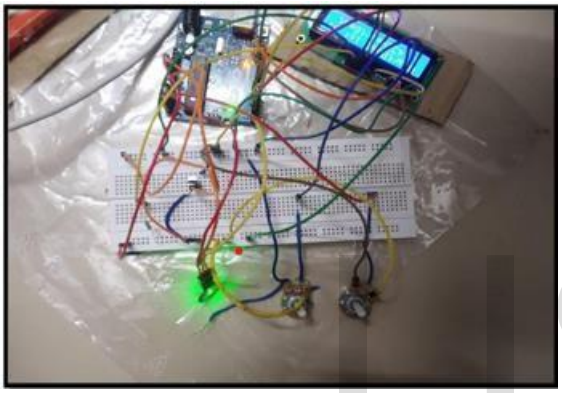

Fig.2. shows the circuit diagram ofhardware setup

RESULT

The code had been executed using the Arduino UNO and the expected output was obtained. The results are as follows, which shows the output for the project created. The images below show the complete run through of the project. It consists of the resistance value, heart rate and temperature value which is indicated in the LED screen. The project is not very expensive and can be used to set up in various red zones during this pandemic to be aware of the surroundings and help fight the disease.

Heart Beat Value

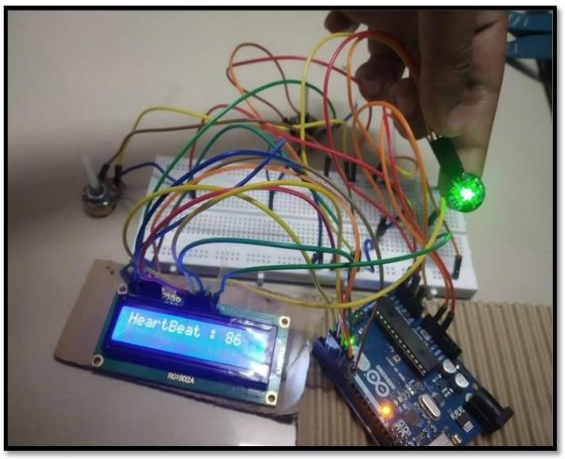

Fig.3. shows the Heart rate measurement value

Temperature Value

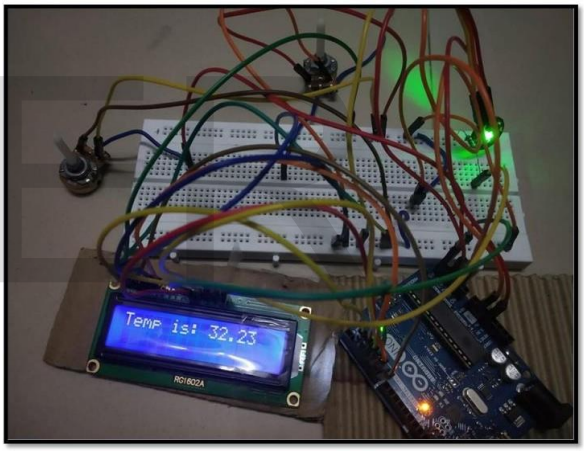

Fig.4. shows the Temperature measurement value

Resistance Value

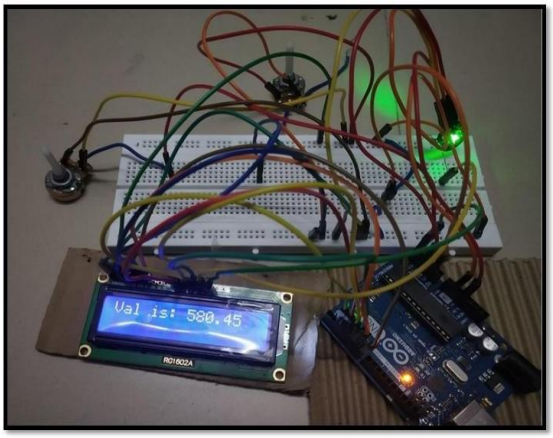

Fig. 5. Shows the resistance value

APPLICATION

Today, such monitoring devices are broadly used for a variety of sports. Usually, players are checked whether theperson is fit to play the game or not. Thisis a guarantee to the same. Having high temperature and heart rate can impact theplayer and the team negatively and can cause serious problems in the long run.

Due to the spread of viruses such as the corona virus. This monitoring system can be used to check if the individual is healthy or not. Mainly, when the individual is not healthy there will be signsof high heart rate and high fever. Thus, thiswould combat this problem and give a clear understanding whether the individualis truly infected with the virus or not today, such monitoring devices are very important.

FUTURE SCOPES

Additional improvements to the system can be made to increase the efficiency and reduce the costs even further. Industries and companies canuse this to further analyze heart and blood related diseases. The explanation for behind this is primarily that these parameters act as fundamental indicator for heart diseases for instance, chronic coronary failure, strokes etc.

Furthermore, such devices can be installed in very busy location with further enhancement to ensure that the spread of the virus is contained and the distance between people is maintained. This system can be usedfor analyzing various other parameters for instance respiration rate, can be essential in the medical field. The productivity can be improved by adding machine learning techniques for prediction purpose.

CONCLUSION

As the pandemic of COVID 19 is still prevailing, this system of monitoring of the body temperature and the pulse rate of the heart which is contact-less helps in continuously tracking of these health parameters. Social distancing is must in these days among the individuals to cut thespread of COVID 19 virus this can be seen if the person is fit and ready to leave his or her home so through this paper and the methods, we adopted for the measuring of health parameters one may get a clear impression of the person if the person is fit or not, symptomatic or not. We learnt in a great deal about the real-world issues that are currently occurring, like COVID andthis system can be utilized for monitoring the temperature and monitoring the heartbeat using Arduino, and would ensure that the distance between each other is maintained and their health conditionis checked without any contact.

REFERENCES

[1] S. Mada, Sandhyarani S, “AnAdaptive Embedded System for helping Patients”, IJCTT, Volume 2,Issue 2, 2011

[2] Y. S. Satyanarayan, Y. R. Satyanarayan, D. H. Desai: “Intelligent Wireless Emergency Alert System for Patient Monitoringusing AT89S52 Microcontroller”, IJAREEIE, Vol. 2, Issue 4, April 2013.

[3] Manisha Shelar, Jaykaran Singh,Mukesh Tiwari, “Wireless Patient Health Monitoring System”, International Journal of Computer Applications (0975– 8887) Volume 62– No.6, January 2013.

[4] Rajalakhshmi.S S.Nikilla, “Real Time Health Monitoring System using Arduino”, South Asian Journal of Engineering and Technology Vol.2, No.18 (2016) 52–60 ISSN No:2454-9614

[5] C. K. Das, M. W. Alam and M. I. Hoque, “A Wireless Heartbeat And Temperature Monitoring System For Remote Patients”, ICMERE2013- PI-197

[6] Long, Guangli. (2016). Design ofa non-contact infrared thermometer. International Journal on Smart Sensing and Intelligent Systems. 9. 1110-1129. 10.21307/ijssis-2017- 910.

[8] W. Wang, S.R. Li, “Temperature acquisition and wireless transmissionbased on 8051 MCU”,

Modern electronic technology, vol.34, no.1, 2011, pp. 146-149.

[9] Monkaresi, H., Calvo, R. A., & Yan, H. (2013). A machine learning approach to improve contactless heart rate monitoring using a webcam. IEEE journal of biomedicaland health informatics, 18(4), 1153- 1160.

[10] Magno, M., Spagnol, C., Benini, L., & Popovici, E. (2014). A low power wireless node for contact and contactless heart monitoring. Microelectronics Journal, 45(12),1656-1664.

[11] Barbosa Pereira, C., Dohmeier, H., Kunczik, J., Hochhausen, N., Tolba, R., & Czaplik, M. (2019). Contactless monitoring ofheart and respiratory rate in anesthetized pigs using infrared thermography. PloS one, 14(11), e0224747.

[12] Yingyan, H. O. U., & Fangzheng, Z.H. U. (2019). Contactless heart rate and respiratory measurement for sleep monitoring. In 12th EAI International Conference on Mobile Multimedia Communications, Mobimedia 2019. European Alliance for Innovation (EAI).

[13] Wu, K. F., & Zhang, Y. T. (2008, May). Contactless and continuous monitoring of heart electric activities through clothes on a sleeping bed. In 2008 International Conferenceon Information Technology and Applications in Biomedicine (pp. 282-285). IEEE.

[14] Pardo, D., Vaz, A., Gil, S., Gomez, J., Ubarretxena, A., Puente, D., ... & Berenguer, R. (2007, March). Design criteria for full passive long range UHF RFID sensor for human body temperature monitoring. In 2007IEEE International Conference on RFID (pp. 141-148). IEEE.

[15] Dicks, B. M., & Koch, J. (2008). U.S. Patent No. 7,364,356. Washington, DC: U.S.Patent and Trademark Office.

[16] Monkaresi, H., Calvo, R. A., & Yan, H.(2013). A machine learning approach to improve contactless heart rate monitoring using a webcam. IEEE journal of biomedicaland health informatics, 18(4), 1153-1160.

[18] Barnes, S. J., Beutnagel, J. W., Mack, R.T., Mills, A. A., & Smith III, J. (1991). U.S. Patent No. 4,988,211. Washington, DC: U.S.Patent and Trademark Office.

[19] Magno, M., Spagnol, C., Benini, L., & Popovici, E. (2014). A low power wireless node for contact and contactless heart monitoring. Microelectronics Journal, 45(12),1656-1664.

[20] Chamadiya, B., Mankodiya, K., Wagner,M., & Hofmann, U. G. (2013). Textile-based,contactless ECG monitoring for non-ICU clinical settings. Journal of Ambient Intelligence and Humanized Computing, 4(6),791-800.

[21] Casalino, G., Castellano, G., & Zaza, G.(2020, July). A mHealth solution for contact-less self-monitoring of blood oxygen saturation. In 2020 IEEE Symposium on Computers and Communications (ISCC) (pp.1-7). IEEE.

[22] Ethawi, Y., Al Zubaidi, A., Schmölzer, G., Sherif, S., Narvey, M., & Seshia, M. (2018). Clinical Applications of Contactless Imaging of Neonates Using Visible, InfraredLight and Others. Advances in Biomedical Sciences, 3(4), 39.

[23] Lemay, M., Bertschi, M., Sola, J., Renevey, P., Parak, J., & Korhonen, I. (2014). Application of optical heart rate monitoring. InWearable Sensors (pp. 105-129). Academic Press.

[24] André, J. C., & Mendes, P. M. (2013,February). Development of a rf contactlessrespiratory rate monitor. In 2013 IEEE 3rdPortuguese Meeting in Bioengineering (ENBENG) (pp. 1-6). IEEE.

[25] Negishi, T., Sun, G., Liu, H., Sato, S., Matsui, T., & Kirimoto, T. (2018, July). Stablecontactless sensing of vital signs using RGB- thermal image fusion system with facial tracking for infection screening. In 2018 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) (pp. 4371-4374). IEEE.

[26] Wieringa, F. P., Mastik, F., & van der Steen, A. F. (2005). Contactless multiple wavelength photoplethysmographic imaging: A first step toward "SpO 2 camera" technology. Annals of biomedical engineering,33(8), 1034-1041.

[27] Massaroni, C., Nicolò, A., Sacchetti, M., & Schena, E. (2020). Contactless Methods for Measuring Respiratory Rate: A Review. IEEESensors Journal.

[28] Pastell, M., Aisla, A. M., Hautala, M.,Poikalainen, & Ahokas, J. (2006). Contactless measurement ofcow behavior in a milking robot. Behavior research, 38(3), 479-4