|| Volume 5 || Special Issue SBPCOE || June 2020 || ISSN (Online) 2456-0774
INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH
AND ENGINEERING TRENDS

A REVIEW ON SMART HEALTH SYSTEM TO MONITOR PEOPLE IN COVID-19 QUARANTINE

Mr.Sushilkumar Thakare, Dr.Mahadeo Kokate
Department of E&TC Engineering
SNJB's Late Sau.K.B.Jain College of Engineering,Chandwad-Nasik State: Maharashtra

---

Abstract: Coronaviruses are a large family of viruses which may cause illness in animals or humans. In humans, several coronaviruses are known to cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The most recently discovered coronavirus causes coronavirus disease COVID-19. People can catch COVID-19 from others who have the virus. The disease spreads primarily from person to person through small droplets from the nose or mouth, which are expelled when a person with COVID-19 coughs, sneezes, or speaks. These droplets are relatively heavy, do not travel far and quickly sink to the ground. People can catch COVID-19 if they breathe in these droplets from a person infected with the virus. This is why it is important to stay at least 1 meter) away from others. These droplets can land on objects and surfaces around the person such as tables, doorknobs and handrails. People can become infected by touching these objects or surfaces, then touching their eyes, nose or mouth. This is why it is important to wash your hands regularly with soap and water or clean with alcohol-based hand rub.The global corona virus pandemic has spread to 187 countries and territories, infecting more than 4.17 million people. Most countries, especially those with a skyrocketing caseload, grapple with a lack of hospital beds and facilities to cater to every patient infected with the virus. a smart health system may help reduce the burden on hospitals, leaving only severe and critical patients in the facilities. Known as the EQuarantine system, the proposed technology monitors coronavirus patients remotely, especially those in home-quarantine. The proposed system is based on combined data from various sensors to detect disease progression and severity. The patient's heart rate, body temperature, breathing, blood pressure, and respiratory rate can be monitored using Internet of Things. Further, the blood pH of the patient can also be measured in real-time. Blood pH can indicate the patient's overall health status. If the predetermined critical values for the patient are exceeded, the HR, HRV, CT values and also the realtime location of patient is sent both to family members and doctor as e-mail and twitter notification. The wearable measurement system allows patients to be mobile in their own social environment, allowing them to live their lives in confidence.

Keywords:-*Internet of things, arduino pro mini, Heart beat sensor, blood pressure sensor, pulse sensor***,**

I INTRODUCTION

The global coronavirus pandemic has spread to 187 countries and territories, infecting more than 4.17 million people. Most countries, especially those with a skyrocketing caseload, grapple with a lack of hospital beds and facilities to cater to every patient infected with the virus. Now, a team of researchers may have the solution to this problem – a smart health system to monitor patients who are in home isolation.

The researchers from Cairo University in Egypt suggest a smart health system may help reduce the burden on hospitals, leaving only severe and critical patients in the facilities. Known as the EQuarantine system, the proposed technology monitors coronavirus patients remotely, especially those in home-quarantine.

A. Monitoring patients remotely:

The coronavirus crisis, many patients who are infected with the virus are left without the care they need, particularly those who are experiencing mild to moderate symptoms. It is essential to monitor them because of the nature of the disease, which may lead to drastic and abrupt changes in their health status.

The our proposed system is based on combined data from various sensors to detect disease progression and severity. The patient's heart rate,body temperature, breathing, blood pressure, and respiratory rate can be monitored. Further, the blood pH of the patient can also be measured in real-time. Blood pH can indicate the patient's overall health status.

The vital signs readings and other data gathered will be combined to determine the patient's health status. The EQuarantine system could also help monitor many uses simultaneously.

The proposes the use of IOT to monitor patients remotely, with the guarantee that patients still receive medicines and the care they need, without overwhelming the health system.

"The proposed system enables monitoring patients from their homes that save governmental cost and time through measuring the changes in patient's medical readings. It will serve humanity in the reduction of corona virus infection and save healthcare members around the world. It also saves hospital places for emergency cases.

Devices that provide continuous monitoring of these patients are very expensive and sensitive and require trained personnel to use them [10]. It is possible for such patients to be followed up continuously with wearable health devices while maintaining their daily lives in the social environment. These wearable devices continuously measure the patient's heart values and, when a symptom of a heart attack has occurred, may send information about the patient's health condition to the family members and the doctor [11]. HR and HRV are used primarily as a diagnostic tool for heart and non-cardiac diseases such as heart failure, aging, Parkinson's disease, diabetes [12]. IoT is a new reality that completely changes our daily life. It is also a way to revolutionize modern health care by providing more personalized and preventive care. Thanks to IOT technology, mutual information sharing among various smart devices has been facilitated anywhere in the world. In this environment, studies on smart health services, which can provide remote diagnosis of the disease, are also accelerated. [13]. Thanks to low cost, low power consumption and high performance, devices that can collect patient heart data can be sent to the patient's family or doctor by smart phone applications [14,15]. Continuous monitoring of a person's health through wearable biomedical devices is now possible with many wearable health kits. However, real-time analyzes and estimates, warnings and alarms on health hazards are not adequately addressed in these devices [15].

In this study, a wearable device is designed to measure vital values such as HR, HRV, and CT, which directly concern heart health. The pulse sensor on the device and the heart related data from the patient's fingertip are analyzed with the Arduino Pro Mini controller. The results of this analysis are transferred to the patient's mobile phone via Bluetooth connection.

Thanks to the "Smart Health" interface created with the Blynk application developer, the data transmitted to the mobile phone is displayed on the screen in real time. When the patient's vital parameters reach critical levels, an audible- visual alert is sent to the patient and family members with the Android-based application. Concurrently, this data and the patient's position information are sent to the patient's family members and the her/his doctor as e-mail and twitter notification. The main purpose of the device is to increase the chances of survival by providing medical assistance to the patient within the first few hours in case of a possible heart attack.

II. MATERIALS AND METHODS

Parameters such as HR, HRV and BT, which are considered to be important health status indicators, have a tremendous diagnostic value. Until recently, continuous monitoring of these physiological parameters has been possible only in the hospital environment, and nowadays with the development of wearable technology, these parameters can be monitored accurately, continuously and in real time

The e-Health Sensor Shield V2.0 allows Arduino and Raspberry Pi users to perform biometric and medical applications where body monitoring is needed by using 10 different sensors: pulse, oxygen in blood (SPO2), airflow (breathing), body temperature, electrocardiogram (ECG), glucometer, galvanic skin response (GSR - sweating), blood pressure (sphygmomanometer), patient position (accelerometer) and muscle/eletromyography sensor (EMG).

This information can be used to monitor in real time the state of a patient or to get sensitive data in order to be subsequently analysed for medical diagnosis. Biometric information gathered can be wirelessly sent using any of the 6 connectivity options available: Wi-Fi, 3G, GPRS, Bluetooth, 802.15.4 and ZigBee depending on the application.

Health monitoring has always been an important topic in biomedical-engineering research. Body temperature is one of the important numerical values to indicate human health status. .e normal body temperature range is typically stated as

36.5 to 37.5°C [1]. .e individual body temperature depends on age, exertion, infection, sex, and the place of the body at which the measurement is made [2]. Rectal measurement, oral measurement, and axillary measurement are the well-known methods for human body temperature measurements [3]. However, each method has disadvantages when performing the measurements. .e thermometers can break if bitten when doing oral measurement, the rectum could be injured when doing rectal measurements, and the thermometer

may need to be left in a place for a long time in order to obtain an accurate measurement. .therefore, the ear thermometer, which measures the temperature of the eardrum, and forehead thermometer, placed on the forehead of the subject to measure the body temperature, were developed. Both methods use infrared sensors to measure temperature, which is different from the mercurial thermometers and standard platinum resistance thermometers used in oral, rectal, and auxiliary measurements.i.e infrared thermometer is good for surface temperature measurement and is compact, lightweight, and easy to use. However,

Figure 1: Body Area Sensor in Human Body.

Heart rate variability (HRV): Heart rate variability is an

important parameter in determining cardiac autonomic functions. HRV varies according to psycho physiological conditions such as stress, relief, exercise, as well as age and health. It is obtained by examining short-term (3-5 min) or long-term (24 h) signals.

PR interval : PR interval is the time between the P wave and the QRS complex. Normal PR interval is between 120-200 ms.

QRS interval: Normal QRS interval is between 70-100 ms.

RR interval, IBI (Inter beat interval): It's the time between two heart beats. This time varies depending on the heart rate. Normal RR interval is between 600-1000 ms.

QT interval: QT interval is the time from the beginning of the QRS complex to the end of the T wave. QT interval and HR are inversely proportional. It also varies with age and sex. Normal range is 320-440 ms.

ST interval : ST interval is inversely proportional to HR and the normal range is 0-150 ms.

PULSE SENSOR

The heartbeat is detected by the reflection of the light emitted by the green LED on the APDS-9008 light sensor. In Figure 2 shows the circuit diagram of the pulse sensor. The low pass filter used at the output of the light sensor clears the signal from high frequency noise.

After the output of the filter, the signal is amplified by the MCP-6001 Op-Amp. The analog signal from this amplifier has a frequency of 0,5 to 4 Hz.

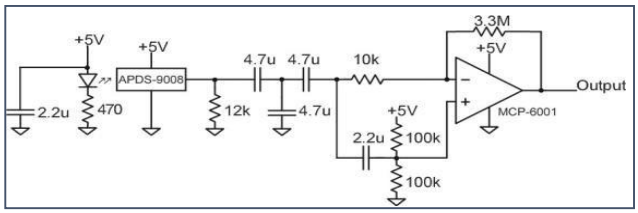


Figure 2: Pulse Sensor Circuit diagram.

The sensor output voltage, which varies from 0.25 to 1.5V, is converted into an output signal with an offset value of 512 adc. This output is normalized around V / 2 which is half the supply voltage. If the sensor cannot make a contact, the V / 2 value is taken from the sensor output.

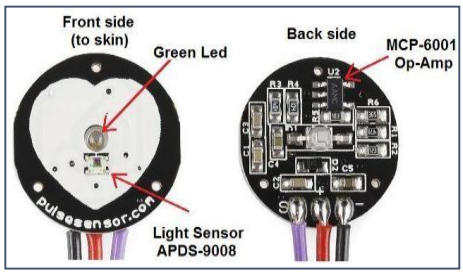


Figure 3. Pulse Sensor front and back sides.

The light emitted by the green LED in Figure 3 is reflected back to the APDS-9008 light sensor in every heart beat, depending on the oxygen saturation in the finger blood. This sensor responds to variations in light intensity and the amplitude of the output signal depends on the amount of light

Breathing Sensor:

The development of wearable devices to monitor breathing activity allows giving rise to various medical care services. For example, considering people with asthma or chronic obstructive pulmonary disease, the environmental conditions directly affect their breathing, and a wearable device is able to continually measure air quality and pulmonary function The device could trigger alarm functions for drug uptake, contact a general practitioner for an appointment,

Arduino Pro Mini Microcontroller

The Arduino Pro Mini is a low cost 8 bit controller that is the smallest of the Arduino series. Due to its small size, it is often preferred in battery operated and portable applications. For Arduino Pro Mini has 3.3V/5V voltage and 8/16 MHz frequency options.

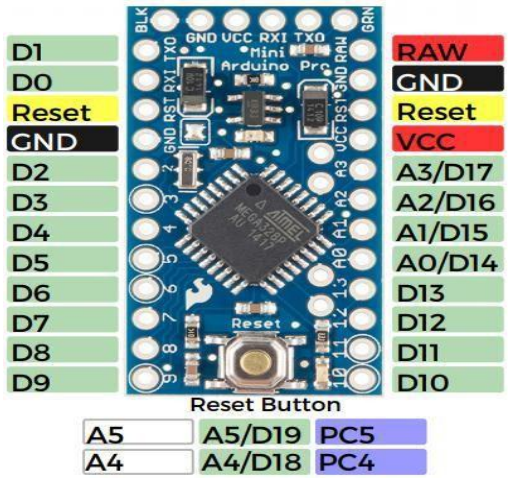


Figure 4: Pinout diagram of Arduino Pro Mini

The digital input-output number is 14 and 6 of them can be used as PWM output. It also has 6 analog input pins in 10 bit resolution.

HC-06 Bluetooth Module

Bluetooth is a communication protocol that uses the frequency band 2,4-2.48 GHz, which is often used in short distance communications applications. The communication distance between Bluetooth modules is usually between 10 and 20 m.

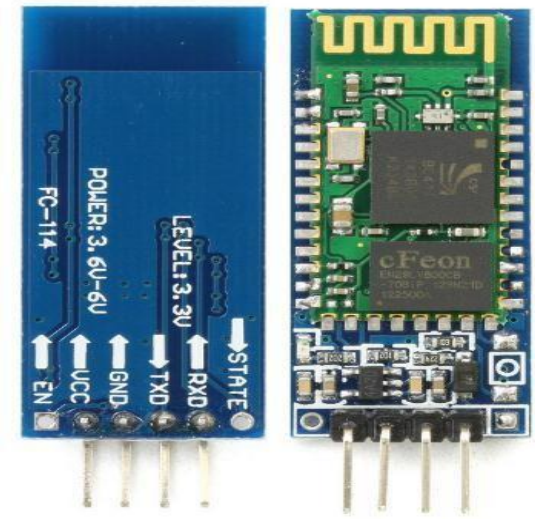


Figure 5. The front and back side of the HC-06 Bluetooth module.

This distance has been increased by about 100 meters with new technologies. However, these newly developed bluetooth modules are not produced in the modular structure suitable for amateur projects

Arduino Software (IDE)

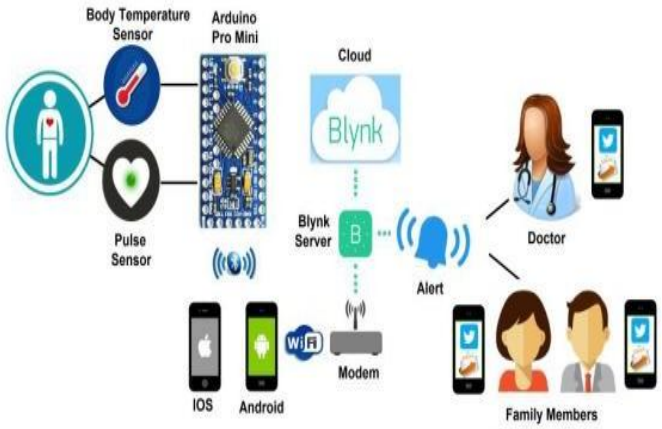
The open source Arduino IDE editor allows you to write code and easily load it to the controllers via USB. The Arduino IDE supports many different controllers besides Arduino kits (Uno, Pro Mini, Mega, Due etc.). This software works on Windows, Mac OS X and Linux.

The Arduino IDE is written in the Java language and is based on the language named Processing/Wiring. The libraries are written in C and C ++ languages and compiled with AVR- GCC and AVR Libc. The code for the "Smart Health" has been developed using this interface. It is also compatible with advanced controllers such as Blynk, ESP, Onion Omega, Raspberry Pi, STM32. These specification of the controllers with bluetooth feature such as ESP32 can be used for closed circuit communication by consuming low energy on-line. Thanks to all these features Blynk; IOT offers solutions for developers at low prices and these users can also benefit from the cloud service at the same time.

III SYSTEM ARCHITECTURE

In wearable smart health monitoring system, Arduino Pro Mini is used as controller and HC-06 Bluetooth module for communication. The pulse sensor is used to collect physiological signals and the sensitive temperature sensor is used for BT measurement. The general structure of the proposed system for smart health practice is shown in Figure

7. The system consists of Arduino Pro Mini, Blynk application, HC-06 Bluetooth module and physiological sensors.



IV PROPOSED SYSTEM

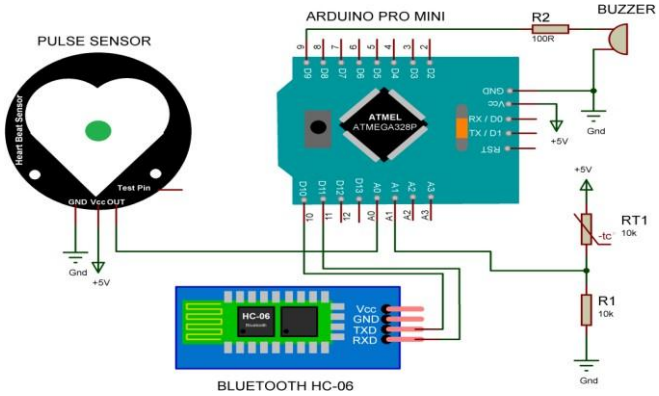


Figure 6: Arduino Pro Mini-based smart health measurement system.

V CONCLUSION

Today, many in every day patients increased of corono our services can be reached with internet technology and the number of applications that use this technology is constantly increasing. IoT technology is expanding day by day to include different sectors and applications. One of them is the smart health sector and this sector offers incredible opportunities for us with new applications. The monitoring of the patients, who should be kept under constant surveillance, in the hospital environment is very difficult with the existing infrastructure and methods. Patients under surveillance in hospitals are dependent on bedding and this makes the patients uncomfortable.

In this study, a wireless patient monitoring system is developed that allows patients to be mobile in their social areas. The developed system continuously measures the heart rate and body temperature of the patient and provides monitoring and tracking through an android based interface. When the patient's vital data reaches a predetermined limit value, the mobile application alerts the patient and the people in the vicinity. This warning is made at a volume level that people near the patient can hear. If there is nobody in the vicinity of the patient who can help him, the patient's heart rate, body temperature, and coordination information are sent to family members and the doctor as e-mail and twitter notifications. The main purpose of the device is to make provide that they get medical aid as soon as possible, in case of a possible discomfort for heart diseases. So there will be an increased chance of survival of patients.our system develop sensor module to Monitor People in COVID-19 quarantine.

"The proposed system enables monitoring patients from their homes that save governmental cost and time through measuring the changes in patient's medical readings. It will serve humanity in the reduction of coronavirus infection and save healthcare members around the world. It also saves hospital places for emergency cases.

REFERENCES

1. Ashton, K, That ‘internet of things’ thing, RFID journal, 2009, 22(7), 97- 114.

2. Gubbi, J., Buyya, R., Marusic, S., Palaniswami, M, Internet of Things (IoT): A vision, architectural elements, and future directions, Future generation computer systems, 2013, 29(7), 1645-1660.

3. Evans, D., The internet of things: How the next evolution of the internet is changing everything, CISCO white paper, 2011, 1, 1-11.

4. Zanella, A., Bui, N., Castellani, A., Vangelista, L., Zorzi, M., Internet of things for smart cities, IEEE Internet of Things journal, 2014, 1(1), 22-32.

5. Ejaz, W., Naeem, M., Shahid, A., Anpalagan, A., Jo, M., Efficient energy management for the internet of things in smart cities, IEEE Communications Magazine, 2017, 55(1), 84- 91.

6. Rahmani, A. M., Gia, T. N., Negash, B., Anzanpour, A., Azimi, I., Jiang, M., Liljeberg, P., Exploiting smart e-Health gateways at the edge of healthcare Internet-of-Things: A fog computing approach, Future Generation Computer Systems, 2018, 78, 641- 658.

7. Thibaud, M., Chi, H., Zhou, W., Piramuthu, S., Internet of Things (IoT) in high-risk Environment, Health and Safety (EHS) industries: A comprehensive review, Decision Support Systems, 2018, 108, 79-95.

8. Ayón, C., Unpacking Immigrant Health: Policy, Stress, and

9. Chaudhary, R., Jindal, A., Aujla, G. S., Kumar, N., Das, A. K., Saxena, N., LSCSH: Lattice-Based Secure Cryptosystem for Smart Healthcare in Smart Cities Environment, IEEE Communications Magazine, 2018, 56(4), 24-32.

10. Abdullah, A., Ismael, A., Rashid, A., Abou-ElNour, A., Tarique, M., Real time wireless health monitoring application using mobile devices, International Journal of Computer Networks & Communications, 2015, 7(3), 13-30.

11. Kakria, P., Tripathi, N. K., Kitipawang, P., A real-time health monitoring system for remote cardiac patients using

smartphone and wearable sensors, International journal of telemedicine and applications, 2015, 8.

12. Goldberger, A. L., Amaral, L. A., Hausdorff, J. M., Ivanov, P. C., Peng, C. K., Stanley, H. E., Fractal dynamics in physiology: alterations with disease and aging, Proceedings of the national academy of sciences, 2002, 99(1), 2466-2472.

13. Majumder, S., Mondal, T., Deen, M. J., Wearable sensors for remote health monitoring, Sensors, 2017, 17(1), 130.

14. Saha, J., Saha, A. K., Chatterjee, A., Agrawal, S., Saha, A., Kar, A., Saha, H. N., Advanced IOT based combined remote health monitoring, home automation and alarm system. In Computing and Communication Workshop and Conference, IEEE 8th Annual, 2018, pp 602-606.

15. Kalid, N., Zaidan, A. A., Zaidan, B. B., Salman, O. H., Hashim, M., Muzammil, H., Based Real Time Remote Health Monitoring Systems: A Review on Patients Prioritization and Related" Big Data" Using Body Sensors information and Communication Technology, Journal of medical systems, 2018, 42(2), 30.

16. Mehmet Taştan*IoT Based Wearable Smart Health Monitoring System Celal Bayar University Journal of Science Volume 14, Issue 3, 2018, p 343- 350

****

Shahajirao Patil Vikas Pratishthan's

S. B. PATIL COLLEGE OF ENGINEERING,

Indapur, Pune – 413106

Organized

An E-National Conference on

"SCIENCE AND TECHNOLOGY"

2K20

on **15th and 16th June 2020**

****