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Design and Implementation of Smart Health Monitoring System

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Abstract - As it is generally known, respiratory illnesses are among the most lethal diseases in the world. We may be able to recognize a number of ailments by being aware of them beforehand if we routinely check our health. Numerous people have died from coronary syndromes. Especially during this time, doctors cannot examine patients in person unless the situation is severe (the Corona virus era). Our study has produced a system that uses the Internet of Things to provide proper assistance to someone in need and enable them to obtain prompt care. With this strategy, a successful method has been developed for remotely monitoring a patient's heartbeat and automatically sending a notification to mobile device/computer. This article presents a wearable device for regular heart rate and blood oxygen monitoring**.** The system developed in this study consists of an Arduino UNO microcontroller system, a Wi-Fi module and an Android-based application**.** The developed system uses the Arduino UNO, which is readily available as an Android device, and a smartphone, making it affordable and cost-effective compared to other developed devices. The developed device shows acceptable results compared to other measuring devices.

***Key Words*:** Arduino UNO, Blood Oxygen Level, Coronary syndrome, Heart-rate, Respiratory illness, Wi-Fi Module**.**

1. INTRODUCTION

The rapid development of technology was a major factor in the expansion of the medical sector. Poor medical services are a result of underdeveloped countries' lack of sophisticated medical equipment for diagnosing and treating patients. Healthcare is a global issue, but it is especially acute in India, the most populated country where most of the residents lack regular access to healthcare because they live in rural areas. As a result, people are living longer on average and dying less frequently, especially in industrialized and wealthy nations.

Patients and doctors need intelligent health monitoring systems that can connect to communication devices and apps to monitor, manage, and collect critical medical information. Especially due to the increment in technological adoption. This article explores using modern technologies such as the IoT-enabled health monitoring. It demonstrates the design of intelligent healthcare systems that leverage the Internet of Things (IoT) to improve health for all. This system design can be used to monitor patient physiologic characteristics in real time. Sensors collect information about the human body and send it to the MCU node. Node MCU sends it to the DBMS (database management system). This DB server handles the storing and retrieving of data. Using an Android app, the patient has access to this information. It's available for download and installation on a tablet or smartphone.

The COVID-19 epidemic affects everyone, but it is patients who suffer the most. This patient has been affected by her Covid-19 epidemic and requires frequent heart rate monitoring by her physician. There is a communication gap between the physicians and nurses involved in these individuals. Widespread lockdowns are having a negative impact on patient conditions. That's when the idea was born to help patients who need to monitor their heart rate frequently. Our problem has been examined and discussed in numerous research projects. This is made possible by insights gained from IoT principles and their applications in the medical field. After carefully reviewing numerous publications, we finally narrowed it down to a basic paper and started building the concept. Our project "Design and Implementation of an Intelligent Health Monitoring System" aims to bridge the communication divide between patients and physicians. The key objective of our initiative is to provide a communication channel between patients and affected families and physicians. We used reliable components such as a heart rate sensor to measure heart rate, an Arduino Uno as the brain of the system, and a BOLT Wi-Fi module that can connect to the internet and send data. We selected AWS VPS as it is widely known for its dependability in providing virtual private server services, to run the application (code) required for heart rate anomaly detection. We used our web API service TWILIO for a notification module that alerts the attending physician of a patient's abnormal heartbeat.

2. LITERATURE SURVEY

[1]. In this, the motivation is taken from the corona virus period when the doctors and nurses could not physically meet patients in-order to assist them with proper medical facilities. So, this work developed a system which uses Internet of things to provide patients quick assistance. This system uses a pulse sensor on the finger and calculates the heartbeat.

[2]. In this, a smart and intelligent health monitoring system is created where the doctors, nurses or the patients could be anticipated beforehand. An alarm could also be assisted to the nearest place.

[4]. In this paper, a sensor named as Photo-Plethysmography is used on the fingertip. The sudden increase and decrease in the heart rate could give alert through SMS, electronic mails, etc and also provide nearly hospitals name and address in case of emergency.

[7]. In this paper, the objective is to design a wearable low-cost PPG system. The hardware of this system uses the basic available components found in the lab. The heartbeat is calculated using heartbeat and then displayed on the LCD.R-R interval method is used for heart beat calculation.

3. OBJECTIVE

The main goal of this project is to develop, execute, and test a live-heart rate monitor that uses a photo plethysmography (PPG) sensor to detect heart rate anomalies. This automated system will send an alert when an irregular heartbeat is detected.

Sub goals of this project include:

1) Development of a mobile app for Android devices to acquire data from sensors and send data or alerts over cellular networks.
2) Identify patient location information and include it in alerts.
3) Verify initial data for the designed system.
   i) You can check your heart rate simply by using our device and your mobile phone.
   ii) Anyone who needs to monitor their heart rate constantly can simply use the device and mobile phone to see the rise and fall of their heart rate.
   iii) Avoid going to the doctor's office or hospital to avoid trouble

4. METHODOLOGY AND PLANNING OF WORK

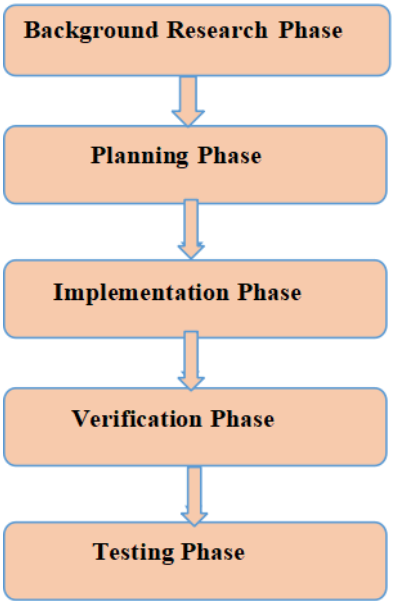

Figure 1. Project Flow Chart

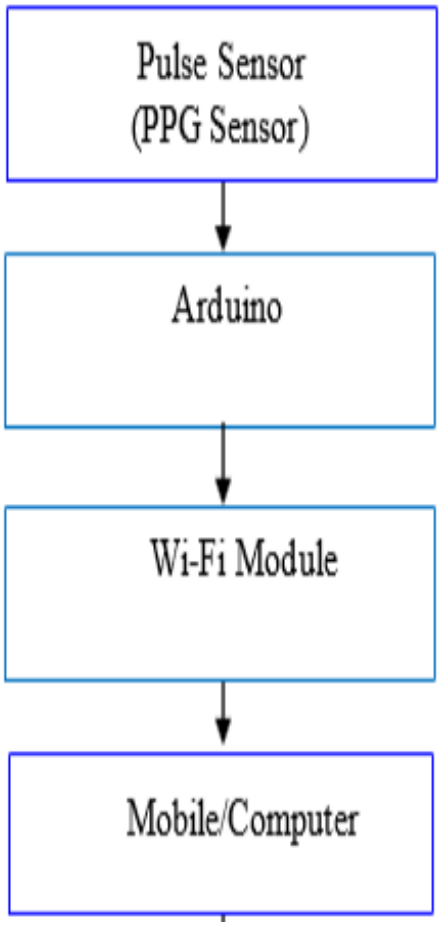

Figure 2. Block diagram of project's overall structure and components

A project goes through the phases outlined in Figure 1. The first phase is the literature survey, in which a comprehensive review of relevant existing research is conducted. The next phase is the planning phase, in which possible methods and approaches for the project are determined based on the literature review. The feasibility of the design, including features, cost, and hardware specifications, is then reviewed before a prototype is created. Each component is tested and the functionality of the prototype is evaluated, using a commercial heart rate monitor as a reference. The final sensor unit consists of a PPG sensor, microcontroller, and WIFI module, and the receiving unit is a mobile phone or computer with a Wi-Fi connection. The heart rate sensor records signals which are analyzed by the microcontroller, which makes calculations and decisions before sending the data to the WIFI module. The data is then received by a mobile phone or computer connected to the WIFI module."

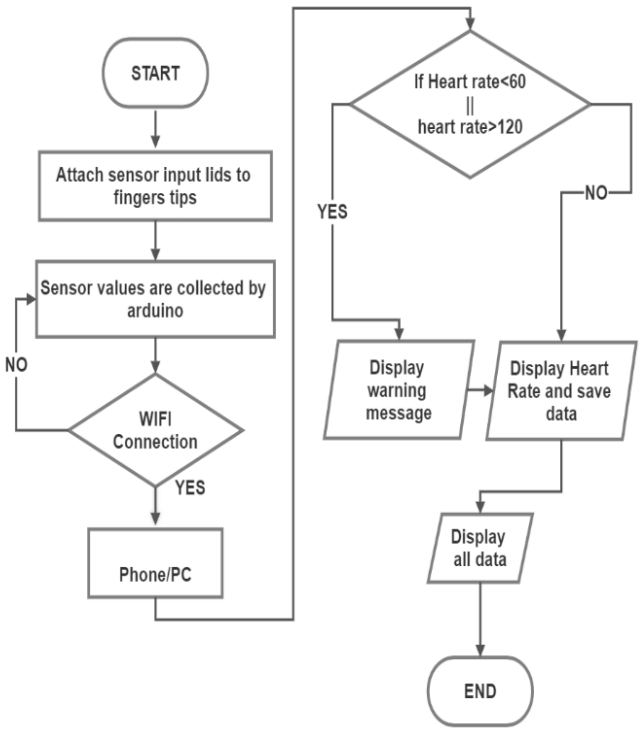

Figure 3.

5. SIMULATION AND RESULT

The system is comprised of Arduino UNO, a WIFI module and a PPG sensor. At first when the user wants to check there heart rate, then the data from the fingertip is transformed serially via Arduino UNO to the Wi-Fi module. The Wi-Fi module creates an alert if the heart rate increases above a certain threshold value. The alert could be in the form of notifications to the user or to the doctor. This system can be further elaborated by adding as many combinations of the same as it is needed. An individual can view and analyze multiple users from the same device and at the same time.

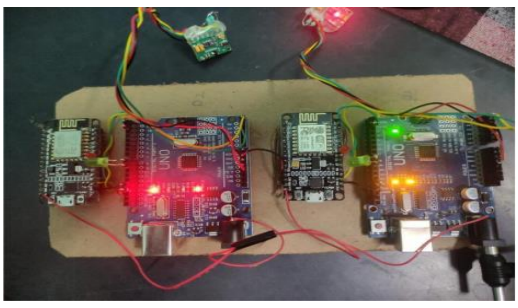

Figure 1.

Figure: 1 shows the finished proposed project. This model comprises of 2 Arduino UNO board, 2 PPG sensors, 2 WI-FI Module

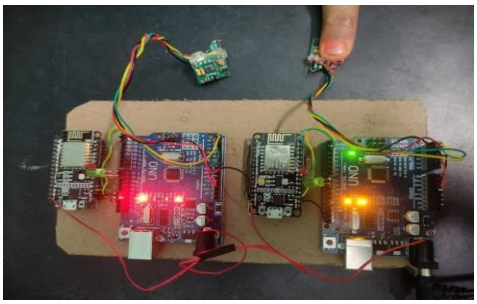

Figure 2.

Figure: 2 shows a finger being placed on PPG sensor. The sensor detects the heart-rates and sends it to the Arduino UNO. It will compare the heart-rate to the set threshold value then a notification will be sent to the mobile phones.

6. CONCLUSION

The covid-19 epidemic has affected everybody, however patients are the foremost severely wedged. This Covid-19 epidemic had a heavy impact on patient's whose heart rates should be oftentimes checked by the involved doctors. These patients' distressed physicians and caregivers have bother act with them. The patients' standing deteriorated as a result of the worldwide adoption of internment. usually this can be wherever the thought for serving to the cluster of patients whose vital sign should be checked often germinated. We've examined and reviewed many analysis articles concerning our issue statement victimization the knowledge we've obtained from the principles of IoT and its applications within the medical business. Our project's primary goal is to create a line of contact between the patients and therefore the involved doctors and well-trained workers. We've used dependable elements like associate degree Arduino Uno that is the system's brain, a heart-rate detector for sleuthing the body's heartbeat, and a BOLT Wi-Fi module for connecting to the web and causing knowledge. To run the program (code) necessary to spot the anomaly existing within the internal organ pulse, we have a tendency to use the foremost dependable VPS service supplier, that is that the AWS VPS. We have a tendency to used TWILIO as our net API service for the notification module that transmits info to the relevant doctor if a patient's internal organ pulse is aberrant. We used TWILIO as our net API service for the notification module, that transmits info to the relevant doctor if a patient's internal organ pulse is aberrant. We have a tendency to bound that our initiative can profit society when it's completed preparation.

REFERENCES

[1]. Hari Kiran Pendurthi, Jaswanth Godavarthi, Hemanth Sai Gokarakonda, Siva Sai Kanneganti, Dr S. Kavitha,*Heart Pulse Monitoring and Notification System using Arduino*, IEEE Xplore Part Number: CFP21OAB-ART; ISBN: 978-1-7281-9537-7,2021.

[2]. Maroua Ahmid, Okba Kazar, Saber Benharzallah, Laid Kahloul, Abdelhak Merizig, "*An Intelligent and Secure Health Monitoring System Based on Agent"*, IEEE Xplore May 2020.

[3]. Ruaa Shallal, Abbas Anooz,*"Remote Patients Monitoring System(Heartbeat and Temperature) using Arduino"*,International Journal of Scientific & Engineering Research, Volume 9, Issue 7,2018.

[4]. Puneet Bansal, Meenal Malik, Ricktam Kundu," *Smart Heart Rate Monitoring System*",IEEE 2018.

[5]. P. Venkat Rao, V. Akhila, Y. Vasavi, K. Nissie, *"An IoT based patient health monitoring system using Arduino Uno"*, International Journal of Research in Information Technology (IJRIT), Volume 1, Issue 1, 2017.

[6]. Md. Shaad Mahmud, Honggang Wang, A.M. Esfar-E-Alam, Hua Fang,"*A Wireless Health Monitoring System Using Mobile Phone Accessories* ",IEEE 2017.

[7]. Pushpa Gothwal,"*Designing of PPG based Heart-beat Monitor"*,International Journal for Research in Applied Science & Engineering Technology (IJRASET) Volume 4 Issue VIII 2016.

[8]. Prosanta Gope, Tzonelih Hwang *"BSN-Care: A Secure IoT-based Modern Healthcare System Using Body Sensor Network*" - 2016.

[9]. P. Gope and T. Hwang, "*BSN-Care: A Secure IOT Based Modern Healthcare System Using Body Sensor Network*," IEEE Sensors Journal, vol. 16, no. 5, pp. 1368–1376, 2016.

[10]. S. Sarkar and S. Misra, "*From Micro to Nano: The Evolution of Wireless Sensor-Based Health Care*," IEEE Pulse, vol. 7, no. 1, pp. 21–25, 2016.

[11]. S. S. Thomas, V. Nathan, C. Zong, K. Soundarapandian, X. Shi, and R. Jafari, *"BioWatch: A Non-invasive WristBased Blood Pressure Monitor That Incorporates Training Techniques for Posture and Subject Variability*," IEEE Journal of Biomedical and Health Informatics, vol.20, no.5, pp. 1291–1300, 2016

[12]. D. Griggs, M. Sharma, A. Naghibi, C. Wallin, V. Ho, K. Barbosa, T. Ghirmai, H. Cao, and S. K. Krishnan, *"Design and development of continuous cuff-less blood pressure monitoring devices*," 2016 IEEE SENSORS, pp.1–3, 2016.

[13]. Zhang, Berthelot, and Lo, "*Wireless wearable photoplethysmography sensors for continuous blood pressure monitoring,"* 2016 IEEE Wireless Health (WH), pp. 1–8, 2016.

[14]. Olaronke and O. Oluwaseun, "*Big data in healthcare: Prospects, challenges and resolutions,"* 2016 Future Technologies Conference (FTC), pp. 1152–1157,2016.

[15]. H. Lin, W. Xu, N. Guan, D. Ji, Y. Wei, and W. Yi, "*Noninvasive and Continuous Blood Pressure Monitoring Using Wearable Body Sensor Networks*," IEEE Intelligent Systems,*vol.* 30, no. 6, pp. 38–48, 2015.

[16]. J. Wannenburg and R. Malekian, *"Body Sensor Network for Mobile Health Monitoring, a Diagnosis and Anticipating System,"* IEEE Sensors Journal, vol. 15, no. 12, pp. 6839–6852, 2015.

[17]. S. V. Gubbi and B. Amrutur, *"Adaptive Pulse Width Control and Sampling for Low Power Pulse Oximetry*," IEEE Transactions on Biomedical Circuits and Systems,vol. 9, no. 2, pp. 272–283, 2015.

[18]. K. Triantafyllidis and Vassilis G. Koutkias "*A Pervasive Health System Integrating Patient Monitoring, Status Logging, and Social Sharing Andreas"* -2014.

[19]. Y. L. Zheng, B. P. Yan, Y. T. Zhang, and C. C. Y. Poon,"*An Armband Wearable Device for Overnight and CuffLess Blood Pressure Measurement*," IEEE Transactionson Biomedical Engineering, vol. 61, no. 7, pp. 2179–2186, 2014.

[20]. B. Xu, L. D. Xu, H. Cai, C. Xie, J. Hu, and F. Bu,"*Ubiquitous Data Accessing Method in IoT-Based Information System for Emergency Medical Services*,"IEEE Transactions on Industrial Informatics, vol. 10, no.2, pp. 1578–1586, 2014.

[21]. Ridza Azri Ramlee, Mohd Azlshah Bin Othman, Mohammad Ikhwan Bin Abdul Aziz, Hamzah Asyrani bin Sulaiman," *Low Cost Heart Rate Monitoring Device Using Bluetooth*",International Conference on Information and Communication Technology (ICoICT) 2014.