

Examining Body Temperature and Heart Rate Using Health Monitoring Sensors

Gholpe Minal Arvind ¹, Dr. Pratik R. Hajare ², Dr. Manish S. Kimmatkar ³

¹ Research Scholar , Department of Electronics Engineering, Mansarovar Global University, Sehore, M.P., India

² Research Guide, Department of Electronics Engineering, Mansarovar Global University, Sehore, M.P., India

³ Associate Professor , Department of Electronics & Telecommunication Engineering , Smt. Radhikatai Pandav College of Engineering , Nagpur

Article Info

Volume 86

Page Number: 41 - 48

Publication Issue:

January - April 2023

Article History

Article Received: 10 January 2023

Revised: 25 March 2023

Accepted: 20 April 2023

Publication: 30 April 2023

Abstract - The advent of health monitoring systems has revolutionized self-monitoring and management over one's health, made feasible by the merging of healthcare with the IoT. Using an LM35 and a pulse sensor, respectively, this project aims to build a system that detects core temperature and pulse rate. These sensors are linked to a controller board known as an Arduino Uno. The Arduino board transmits data wirelessly using the wifi module. Things on the Internet of Things platform may be able to connect wirelessly with the aid of the ESP8266. Additionally, physicians may effortlessly monitor many patients at once and provide prompt guidance to their patients. Rest assured, the confidentiality of all patient information is our top priority.

Keywords: - Health monitoring, Sensor, Pulse, Temperature, Patient

I.Introduction

There has been enormous disruption at the intersection of healthcare and technology in the last several years, and this has reshaped traditional approaches to patient care and medical diagnostics. An example of a significant development in this field is the introduction of health monitoring systems that use the IoT. There is tremendous promise for this novel integration of healthcare and IoT technology to revolutionize the way individuals monitor and manage their health in both institutional and community-based settings. Health Monitoring Systems made possible by the Internet of Things (IoT) provide previously unimaginable ease, precision, and efficiency to healthcare via the smooth integration of various medical devices, sensors, and applications. The Health Monitoring System relies heavily on the IoT. Connected gadgets that can exchange information and talk to one another over the web form this network. These gadgets have a variety of technology built into them, such as sensors and software. The interconnectedness of various devices has given rise to a plethora of healthcare goods and applications, such as smartwatches, wearable fitness trackers, and sophisticated medical sensors and diagnostic instruments. Through the constant collection, analysis, and transmission of data on a range of health and wellness parameters, health monitoring systems

made possible by the internet of things (IoT) offer preventative interventions and personalized treatment programs. Both patients and healthcare professionals benefit from this data's subsequent usage.

Internets of Things (IoT) health monitoring solutions are able to go beyond the limitations of traditional healthcare delivery models because of their ability to provide remote patient monitoring. Everyone can now keep tabs on their vitals—heart rate, blood pressure, glucose levels, and activity levels—in real-time, no matter where they are, thanks to wearable devices with biosensors. By enabling early detection of health risks and their timely intervention, this capability of remote monitoring not only makes healthcare more accessible and easy, but it also minimizes the load on healthcare facilities and avoids medical crises from worsening.

Internet of things-enabled health monitoring solutions are also vital because they empower individuals to make informed decisions about their health and wellbeing by giving them access to personalized feedback and practical insights. With the use of advanced data analytics and machine learning algorithms, these systems can sort through vast amounts of health data collected from various sources, including environmental sensors, electronic health records, and wearable devices. This data-driven approach may be used to provide personalized health recommendations, lifestyle adjustments, and preventive treatments based on each person's unique health profile and goals.

Another area where internet-of-things-based health monitoring systems show great potential is in the improvement of long-term health outcomes and the management of chronic diseases. Continuous monitoring of critical physiological markers and health metrics may help healthcare providers improve disease management and reduce the risk of repercussions. Because of this, they are able to detect even subtle changes in their patients' health and adjust their treatment plans accordingly. In addition, the Internet of Things (IoT) facilitates seamless communication and collaboration among healthcare practitioners, allowing for multidisciplinary care coordination and rapid therapies, which is particularly useful for complex and long-term illnesses that need constant monitoring and treatment.

Although there are several benefits to health monitoring systems that rely on the Internet of Things (IoT), there are also many challenges that must be resolved before these systems can be efficiently and extensively used in healthcare institutions. Concerns about data privacy and security are at the top of the list since collecting and transmitting sensitive health information via networked devices is fraught with cybersecurity risks and privacy dangers. Compliance regulations and issues with device and platform interoperability further hamper healthcare ecosystems' efforts at seamless integration and data exchange.

II.Review Of Literature

Bhuiyan, Mohammad et al., (2022) As a consequence of the new COVID-19, health care is becoming more important for every country. Internet of things (IoT) health monitoring technologies may be the future of caring for the ill and old. This study evaluated the benefits and drawbacks of several internet-of-things-based health monitoring systems. Looked through reputable databases of academic journals and conferences using keywords to find papers that would be useful for the study Peruse unique articles that were pertinent to this research. The selected papers were further classified meticulously so that their contributions

and research concentration could be understood. After making an effort to identify their research gap and difficulties, they proposed an offline GSM-based health monitoring system that could connect with healthcare providers over communication networks. Hopefully, this model will act as a beacon for the researchers as they embark on the journey to develop an Internet of Things-based system for human long-term health monitoring.

Sali, Sharanbasappa & Parvathi, C. (2021) Poor nutrition, lack of exercise, and other risky lifestyle choices (such as smoking and excessive alcohol use) are only a few of the many potential causes of chronic disease. Among all disorders, the pace of increase for chronic diseases is unparalleled. A system for long-term and continuous health monitoring in real-time is possible thanks to the design of this system. Thus, biomedical sensors may be used to track the patient's vital signs, including their heart rate, blood pressure, electrocardiogram (ECG), temperature, and pulse oximetry. By affixing the sensors to the patient's body, an Arduino Uno controller board can process the parameters collected from the patient. After processing, the parameters are wirelessly sent to a healthcare facility. We compare the obtained biological parameters with the predefined threshold values. If the parameter is determined to be normal, it is either kept in the database or an alert message is sent together with the data to the doctor or someone responsible for the patient's care by a wireless module.

Valsalan, Prajoona et al., (2020) Ever since the unique Corona virus was introduced, healthcare has been an extremely important issue for every country. Therefore, the best way to handle an epidemic of this type is with a health monitoring system that is based on the Internet of Things. An ever-growing body of research, especially in the medical area, is focusing on the Internet of Things (IoT), the next generation of the internet. One possible explanation for the quick growth of remote health care monitoring is the increased use of smartphones and wearable sensors. Internet of Things (IoT) health monitoring may help prevent the spread of disease and provide an accurate diagnosis of the patient's current health status even when the doctor is situated at a large distance. A portable physiological monitoring framework that can continually record the patient's temperature, pulse, and other essential room parameters is the goal of this research. We showcased a continuous checking and control device that would track the patient's condition and save their data on a server using Wi-Fi Module-based remote connectivity. A method that uses the Internet of Things (IoT) to monitor health remotely has been proposed. With this setup, authorized users may access data stored on any Internet of Things platform. Medical professionals would use these data as a basis for illness diagnosis.

Senthilkumar, Sudha et al., (2019) The most current health research reports that several thousand individuals have died due to the overwhelming mental and physical demands placed on them. More individuals are dying in a crisis because doctors aren't there to treat them. Thanks to technological improvements, the proposed system can continuously monitor the patient's vital signs from anywhere in the world. The researcher plans to build an IoT infrastructure that can track people's health for the benefit of the healthcare system. The doctors will be notified as soon as there is an emergency that needs immediate treatment. It considers not only the body's movements but also the body's variables, including the pulse sensor, humidity, and temperature. Symptoms of abnormal physiological traits may be better tracked by comparing patients' physiological data to that of normal conditions.

Mohan, Madhan & Pichandi, Sathya (2019) The healthcare industry is one that stands to benefit greatly from the expansion of the Internet of Things (IoT). The Internet of Things (IoT) facilitates human connection by intelligently improving people's wealth and health via the usage of wearable technologies. Thanks to new developments in wireless sensor networks, a new fad has formed in the IoT world. Smart health is one of the most important applications of the Internet of Things. A smart health care system can expeditiously monitor individuals with unusual health concerns and deliver them a treatment when they need it. These kind of solutions may be found by using wearable devices that reliably track the patient's vitals and activity all the time. This initiative's main goal is to conduct extensive studies on data collecting from sensors, data processing, and patient feedback based on various health parameters.

Sathya, M. et al., (2018) when thinking about the global impact of the Internet of Things (IoT), the healthcare applications are at the top of the list. The integration of cutting-edge medical resources and the provision of intelligent and efficient healthcare services have both been greatly facilitated by the Internet of Things. Contemporary sensors, which patients may wear or immerse in their bodies, allow for continuous monitoring of their health. Early disease prediction may be achieved by analyzing, pooling, and mining the data collected in this way. Medical practitioners are helped in the process of therapeutic personalization by processing algorithms, which also improve patient outcomes and help health care providers save money. Also included in this research are some of the real-world problems that crop up when trying to construct an IoT health monitoring system.

Soni, Vishal Dineshkumar (2018) The Internet of Things has several promising uses that might improve patients' quality of life. The gadgets can keep track of patient data, so doctors may learn more about their patients without ever having to set foot in a clinic. By reducing the likelihood of potentially harmful misunderstandings that may develop throughout the process, this approach also has the ability to enhance patient outcomes. Without integrated electronic health record (EHR) systems, there are a lot of problems with the Internet of Things (IoT) in healthcare. With certain EHRs, patients may even upload medical history directly into their files. But it currently only works with a small handful of major players in the EHR market, and it doesn't provide providers any specifics about how the system processes data, which might hurt the company. Depending on the device's purpose and the prescribing physician, interoperability poses a variety of challenges for data maintenance in different medical devices.

III. Proposed Algorithm

The proposed system is shown in Figure 1. For the express goal of collecting data pertaining to health, health monitoring sensors are used. Using a controller to send data over the internet is one way to do wireless communication. Processing of data has taken place on the server. The server location is responsible for collecting and consolidating the data. Data management allows for the presentation of health-related information on a web page in an easily understandable way.

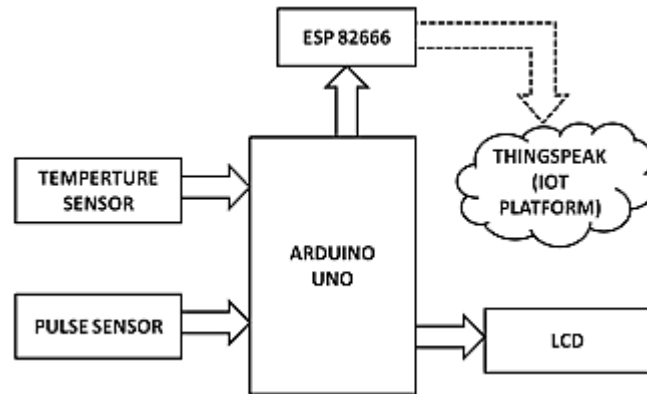


Figure 1: Block diagram of system

The operating flow of the system is shown in Figure 2. The device will enter emergency mode and inform the doctor of the patient's status if the sensor data shows any unexpected behavior. As a result, it helps hospitals deal with potentially fatal circumstances.

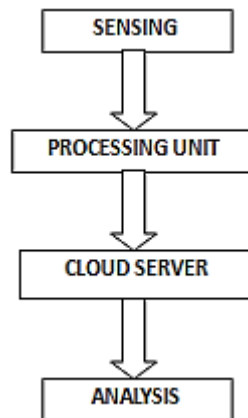


Figure 2: Working flow of system

Table 1 details the system's modules along with the requirements for each.

Table 1: Modules and their Specification

Module	Item	Specification
Controller	Operating voltage, digital pins, Flash memory	5V, 14,32 KB
Temperature sensor	Temperature range, power, output impedance	-55C to 150C,4- 30V,0.1W for 1mA load
Pulse sensor	LED, gain, Power	Infrared LED,100,3.3V
Wifi module	Power , boud rate ,range	3.3V,9600BPS, Up to 10m
LCD	Power, display	5V,plasma display

IV.Results And Discussion

The link between the controller, sensors, and LCD is shown in Figure 3. Figure 4 shows the

temperature and pulse sensor output on the LCD.

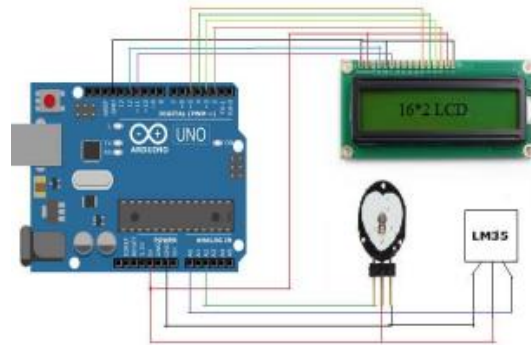


Figure 3: Interfacing of LCD and sensors with Arduino



Fig 4: Setup of System

In Fig. 5, we can see a simulation program window inside the Arduino IDE. See Figure 6 for an example of how the IoT platform displays parameters online: temperature and heart rate.

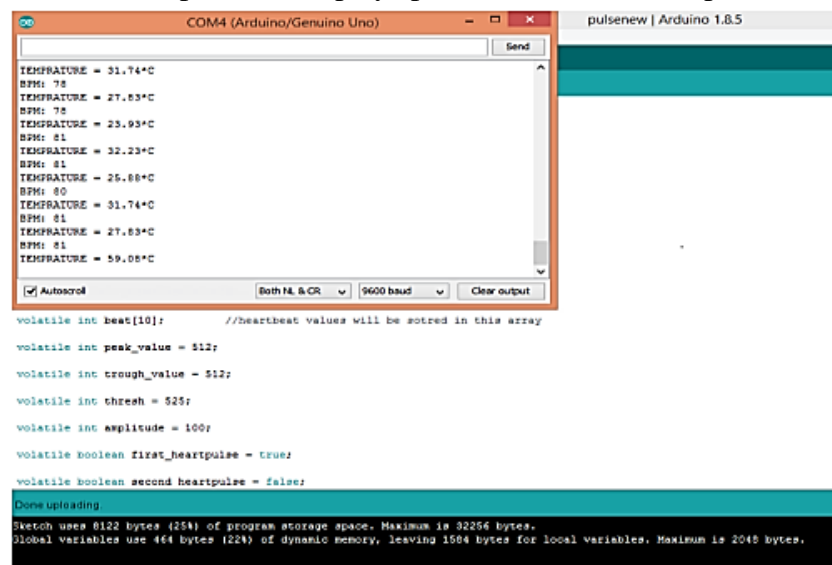


Figure 5: Simulation of system on Arduino IDE

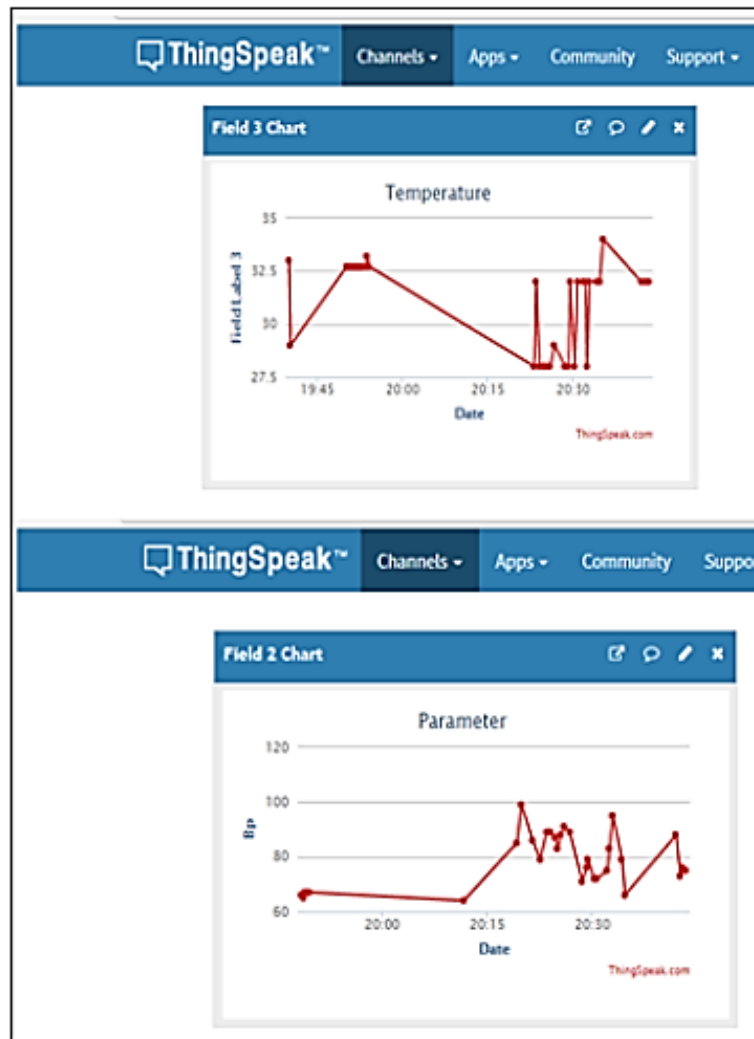


Figure 6: Graphs of sensor output by thingspeak

V.Conclusion

We need to solve a lot of challenges before health monitoring technologies that are enabled by the Internet of Things (IoT) can become widely used and effective. Some of these obstacles include the need to comply with regulations, worries about data privacy and security, and problems with interoperability. It is critical that all the many stakeholders in the healthcare system collaborate to find creative ways to overcome these challenges while also making the most of the opportunities presented by the Internet of Things—a technology that can improve healthcare delivery. As time goes on and new paradigms form in healthcare, the potential applications of internet-of-things-based health monitoring systems will only grow. These systems may change healthcare on a global and regional level in a number of ways, including making it easier to detect and treat chronic illnesses at an early stage and expanding access to medical treatment in underserved areas.

References: -

- [1] Bhuiyan, Mohammad & Billah, Md & Saha, Dipanita & Rahman, Md. Mahbubur & Kaosar, Mohammed. (2022). IoT Based Health Monitoring System and Its Challenges and Opportunities. 10.1007/978-3-030-90618-4_19.

- [2] Sali, Sharanbasappa & Parvathi, C. (2021). Real Time Health Monitoring System Using IoT. 9. 5. 10.1729/Journal.26807.
- [3] Rani, Sudha. (2021). Modern Health Monitoring and Analysis Using Iot Technology. Turkish Online Journal of Qualitative Inquiry. 4961-4972.
- [4] S, Jayakumar & R, Ranjith & R, Tejswini & S, Kavil. (2021). IoT Based Health Monitoring System. 10.3233/APC210140.
- [5] Sultana, Salma & Rahman, Sadia & Rahman, Md & Chakraborty, Narayan & Hasan, Tanveer. (2021). An IoT Based Integrated Health Monitoring System. 549-554. 10.1109/ICCCA52192.2021.9666412.
- [6] Valsalan, Prajoona & Tariq, Ahmed & Hussain, Ali. (2020). IoT based health monitoring system. 2020. 10.31838/jcr.07.04.137.
- [7] Senthilkumar, Sudha & Krishnamurthy, Brindha & R, Charanya & Kumar, Abishek. (2019). Patients Health Monitoring System Using IOT. Indian Journal of Public Health Research & Development. 10. 252. 10.5958/0976-5506.2019.00699.5.
- [8] Mohan, Madhan & Pichandi, Sathya. (2019). Smart Health Monitoring System through IOT.
- [9] U B, Mahadevaswamy & ZAIBABUKTIYAR, DURGAD. (2019). IoT Based Smart Health Monitoring System. i-manager's Journal on Electronics Engineering. 9. 8. 10.26634/jele.9.2.14867.
- [10] D, Kumar & S, Ramkumar & R, Rubini. (2019). IOT Based Health Care System. International Research Journal of Multidisciplinary Technovation. 1. 41-46. 10.34256/irjmtcon6.
- [11] Sathya, M. & Madhan, S. & Jayanthi, K. (2018). Internet of things (IoT) based health monitoring system and challenges. International Journal of Engineering and Technology (UAE). 7. 175-178. 10.14419/ijet.v7i1.7.10645.
- [12] Soni, Vishal Dineshkumar. (2018). An IoT Based Patient Health Monitoring System. International Journal on Integrated Education. 1. 43-48. 10.31149/ijie.v1i1.481.
- [13] Sangeetha, R & Ramalingam, Jegadeesan & Ramya, M & Vennila, G & Student, CSE. (2018). Health Monitoring System Using Internet of Things. International Journal of Advanced Research in Engineering & Technology. 4. 13-18. 10.7324/IJERAT.2018.3201.
- [14] Gupta, Naina & Saeed, Hera & Jha, Sanjana & Chahande, Manisha & Pandey, Sujata. (2017). IOT based health monitoring systems. 1-6. 10.1109/ICIIECS.2017.8276181.
- [15] Parvateesam, Kunda. (2016). IoT based Real Time Patient Health Monitoring System.