Volume 13, No. 3, 2022, p. 3051-3056 https://publishoa.com ISSN: 1309-3452

# Health Monitoring System Using IoT Sensors

# Silpa C<sup>1</sup>, Dr. S Srinivasa Chakravarthi<sup>2</sup>, Jagadeesh kumar G<sup>3</sup>, Dr. K.K. Baseer<sup>4</sup>, E. Sandhya<sup>5</sup>

<sup>1</sup>(Assistant Professor, Department of IT, Sree Vidyanikethan Engineering College, Tirupati)

<sup>2</sup>(Associate Professor, Department of CSE, Amrita Vishwa Vidyapeetham, Chennai)

<sup>3</sup>(Assistant Professor of MCA, Sree Vidyanikethan Engineering College, Tirupati)

<sup>4</sup>(Professor, Department of IT, Sree Vidyanikethan Engineering College, Tirupati)

<sup>5</sup>(Assistant Professor, Department of IT, Sree Vidyanikethan Engineering College, Tirupati)

Received 2022 April 02; Revised 2022 May 20; Accepted 2022 June 18.

#### Abstract

In today's world, healthcare has become extremely important because of the spread of novel corona virus. Health issues not only affect the quality of life of a person but also influences the country's economy. The Internet of Things (IoT) is becoming a new revolution in the Internet as a fast-growing research topic, especially in the health field. With the help of Internet of things various resources can be connected to improve the quality of life. The proposed system presents a Healthcare monitoring system that is embedded with sensors, the system monitors the vital signs of a person. The data is acquired with the help of sensors and sent to Arduino that is the microcontroller which will process and analyze the data. This analyzed data is stored on cloud for future reference. This data will be used to know the condition of the patient. And it will alert the patient's relatives and doctors in crunch situation with a text message to the mobile phone

Keywords- Internet of Things, Arduino, Sensors, Thingspeak.

Background: IoT in healthcare[1] is a crucial actor in improving medical facilities for patients while also assisting physicians and health centers. This system contains various sensors and also web or mobile applications, that helps in keeping track of health of a patient. An automated device keeps track of the heart rate, temperature, blood pressure bodily motions, of a patient. Readings are gathered with the help of sensors which are mounted on the body of the patient, and transmits a signal to the Raspberry Pi, where the results may be viewed from anywhere via the internet and a GSM module. M-health (mobile health) [3] is collecting real-time patient data with the help of mobile devices and also store this data in servers that are linked to the Internet. A diverse variety of clients can access the information (e.g., doctors, patients, etc.). Doctors use M-health data to monitor, diagnose, and treat patients. Key features of m-health devices include low energy consumption, improved security, connectivity through IP and small in size. It aids in collecting via health data through health devices and wearables[11], and keep track of health of a patient with that data. Doctors can access patient information making it easier to diagnose, track health remotely. Here's a non-invasive breath test for diabetic patients to check their condition. It's been discovered as an easier tool for diagnosing diabetic ketoacidosis and preventing acute complications of type 1 diabetes mellitus. Ketone levels and acetone gas concentrations are possible to monitor via breath measurement. The level of ketone and acetone in the urine was measured. Patients can self-monitor their diabetes condition using this way, and the IoT system can send alerts immediately to hospital medical staff. The database's personal website is built to provide ketone levels and present status to the patients. The patient is required to log in and register on the website to check their health status. The advantages of an assisted remote health monitoring system<sup>[4]</sup> based on IoT over a typical system are tremendous. Sensors that are used have shrunk in size and weight, making it possible for patients to keep track of their health at all times. This system allows continuous monitoring of a patient's health status, helps in early detection of serious diseases and carry out the appropriate actions. Machines can generate statistical data that is linked to a person's health status. It is possible to collect data faster, more voluminously, and without errors, which human approaches could never do. A temperature sensor (DHT11) and a humidity sensor are used to read three values during exhale and records the data after a 5ms delay. As a valid result, the maximum values of ketones are used. The Arduino receives the readings from the sensors, and this data is transmitted to the database using aWi-Fi module. Php MyAdmin is the database that is used as database.

Volume 13, No. 3, 2022, p. 3051-3056 https://publishoa.com ISSN: 1309-3452

#### 1. Introduction

People's health is a crucial aspect of people's lives. However, the global health crisis has created challenging conditions as a result of a number off actors, such a slow quality of health care services, distance from rural to urban areas, and unavailability of doctors during peak times. With the growth of IoT, any object can now be connected internally, and it has been called the next technological revolution. Smart parking, smart homes, smart cities, and smart climate are some of the applications of IoT. IoT is mostly employed in healthcare since it improves the environment and allows for better tracking of health conditions. IoT is about linking computers to the Internet with the help of sensors and networks. These interconnected sensors can be utilised in health-monitoring devices. The primary objective is designing and implementing an intelligent health monitoring device that keeps track of the health of a patient with the help of sensors and also remind the family members in case of critical situations through Internet.

## 2. Proposed Method

This system collects data from various sensors i.e., data acquisition and communication is controlled by main controller (Arduino UNO) for transmission of data using wireless internet connection (ESP8266). Data processing can be achieved using ThingSpeak cloud. All the information collected are kept in cloud for better medications and data is displayed in graphical format in cloud for easy understanding and by using API key, channelID of the patient can be used in mobile phone using ThingViewAppi.e., Data Management.

**Arduino UNO**: It is a micro controller based on ATmega328 controller. It has a USB port as well as6 analogue pins and 14 digital I/O pins. Serial communication is performed with the help of Tx and Rx pins.

ESP8266:It is a is an inexpensive WI-FI microprocessor which is used to create hotspot and to connect to network. It will collect, store and retrieve data in cloud.

**ECG Sensor**: The ECG sensor IC (AD8232) calculates the electrical movements of the heart, and the chip AD8232 is utilised to decrease noise. The electrical activity that passes through the heart is measured and recorded by an ECG. Each heartbeat sends an electrical impulse through your body.



Fig. 1: Block diagram of the proposed System

**TemperatureSensor**: The temperature sensor that is used in this project is DHT11 where it detects temperature, humidity levels present in surrounding along with body temperature. Relative humidity is calculated with the electrical resistance between 2 electrodes that is measured with the help of DHT11 sensor.

**LCD Display:** LCD is most widely used in recent years like calculators. It is a 16\*2 display where 16 characters can be displayed in one row. Green display with black characters where the values are displayed.

Volume 13, No. 3, 2022, p. 3051-3056 https://publishoa.com ISSN: 1309-3452

**GSM Modules**: GSM Module is a complete Quad band of GSM which has GPS for satellite navigation. It is an integration of GPRS and GSM in a SMT package, it helps users to develop GPS applications, they help users to develop and track devices and these modules can be controlled by giving AT (ATTENTION) command

## 3. Working Principle

- A. Collecting Data: Data is collected from different sensors like DHT11, AD8232, pulse sensor. Temperature is collected using DHT11 where it collects values like humidity in atmosphere along with body temperature, AD8232 helps in getting patients ECG values and pulse sensor gives the values and the obtained data will be updated to Arduino as continuous monitoring will be performed.
- **B.** Sending Data to Cloud: The data that is updated to cloud will be sent to cloud we are currently using and then this data will be displayed in form of graphs which are easy to understand.
- C. Analyzing Data: The data that is collected from various sensors are analyzed.

**Working of temperature sensor:** Some threshold values will be set to know the limit if the limit is low or high the SMS alerts will be sent and a remainder will be sent as take a pill.

## Table 1: Temperature ranges

BODY TEMPERATURE	RANGE	ACTIONS TAKEN
Normal	>36.1ocand<=37.2oc	Continue monitoring
Low	<=35oc	Send alert and remind to take pill

#### Table 2: Pulse ranges

HEART RATE	RANGE	ACTIONS TAKEN
Normal	60 to 100 per min	Continue monitoring
Low	<60per min	Send alert and remind to take pill
High	>100Per min	Send alert and remind to take pill

**Working of Pulse sensor:** Some threshold values will be set to know the limit if the limit is low or high the SMS alerts will be sent and a remainder will be sent as take a pill.

4.

Results



Fig.2: LCD Display

If there is any abnormality then a message will be display for the patient "TAKE PILL" with a buzzer.

Volume 13, No. 3, 2022, p. 3051-3056 https://publishoa.com ISSN: 1309-3452



Fig.3: ThingSpeak login page

To analyze the data in ThingSpeak, we need register and then login to the ThingSpeakaccount. Now we need to create a channel, then APIKEY is generated. This APIKEY will be used in programming the Arduino so in this way the Arduino is connected to ThingSpeak.

4 3 C is the provine of a set.						e 🛊 🔞 1
C) ThingSpeak*	Cumde-	here - September			Constantial like How to firsy 👜	
Canad Josepherdy, By	Ny Grands Watch of Usin P575, Chand	4.h.				
My Channel	s	_			Help	
Sever Chargers	540.03	in ne		a	Usi was dear in a ThingSpeek channel from a cavity. Ya mananesi channel, a thora the sats.	
Kane			Crister	Updated	Coulder Connection and an approximation of the second	
<ul> <li>Metallitic monitoria</li> <li>Pressi Pune Series</li> </ul>	ng system   Sertes   strike	Call Yort/Cases	AG3 (44 33	2021 04 24 25 04	Clocal the call on the scenario the tablets on the table entitled with evolution and losser single scheme through with the tag	
					Learn So cold Channels, og 25 eine forskorr 14. Learn være ebest Finngägs av Channels,	
					Examples	
					<ul> <li>Antonio</li> <li>Antonio Mitta (2006)</li> <li>Strand Mitta (2006)</li> <li>Transform RI</li> <li>Materiano Materia</li> </ul>	
					Upgradie Sectored resolution	
					See from the standard strangest?	





Fig.5: Channel stats will be displayed

Volume 13, No. 3, 2022, p. 3051-3056 https://publishoa.com ISSN: 1309-3452

Statistics of the patient will be displayed on the channel. Parents and doctors receive a text message on their phone to check the health of the patient in critical situations.

3:57 PM 😇 🗰	5.at 🖬 .at (52)
← Health Monito	oring System
<b>D</b> 3:56 PM	
Patient is abnormal pl	ease check

Fig.7: A text message will be sent in critical situation

#### 5. Conclusion

Health monitoring system can be used highly in emergency situations. To make life simpler, for remote area people, it has so many benefits. Doctor can easily monitor patients without any physical contact. It gives accurate and precision results to both doctors and patients. This system has SMS alert configuration, patients can receive a text message to their smart phones about their body condition, if they are abnormal. These smart devices are really helpful to people, who need to travel long distances, they provide the result in real time, so physician can easily understand the problem of the patient. These are very helpful to identify the disease in an early stage, they work as mobile health systems. Here GSM modem is used to send the text message about the patient's condition to the physician and patient's relatives. The basic work of smart health monitoring system is to give accurate results about the patient to the physician and this data is also uploaded to the cloud, so physician or patients can recheck the reports if they need in future. This device is really helpful in this pandemic because it allows doctors to check the patient's condition without physical contact, so that doctors will not get infected with the virus.

#### References

- [1]. Shubham Banka, Isha Madan and S.S Saranya(2018), Smart Healthcare Monitoring using IoT, International Journal of Applied Engineering Research, ISSN 0973-4562 Volume 13, Number 15, pp.1984-11989.
- [2]. RuhaniAb. Rahman, NurShima Abdul Aziz, MurizahKassim, MatIkramYusof, IoT-based Personal Health care Monitoring Device forDiabetic Patients, 97815090- 4752 9/17/2017 IEEE
- [3]. S.H.Almotiri, M.A.Khan, and M.A.Alghamdi.(2016), Mobilehealth(m-health)system in the context of IoT, IEEE 4th InternationalConference on Future Internet of Things and Cloud Workshops(FiCloudW), pages 39–42, Aug2016.
- [4]. K.R. Darshan and K.R. Anandakumar(2015), A comprehensive review on usage of internet of things (IoT) in healthcare system, in Proc.International Conference on Emerging Research in Electronics, Computer Science and Technology.
- [5]. P. Chavan, P. More, N. Thorat, S. Yewale, and P. Dhade(2016), ECG Remote patient monitoring using cloud computing, Imperial Journal of Interdisciplinary Research

Volume 13, No. 3, 2022, p. 3051-3056 https://publishoa.com ISSN: 1309-3452

- [6]. Gulraiz J. Joyia, Rao M. Liaqat, Aftab Farooq, and Saad Rehman(2017), Internet of Medical Things (IOMT): Applications, Benefits and Future Challenges in Healthcare Domain, Journal of Communications Vol. 12, No. 4.
- [7]. K. Perumal, M. Manohar (2017), A Survey on Internet of Things: Case Studies, Applications, and Future Directions, In Internet of Things: Novel Advances and Envisioned Applications, Springer International Publishing, 281-297.
- [8]. S.M. Riazulislam, Daehankwak, M.H.K.M.H., Kwak (2015), The Internet of Things for Health Care: A Comprehensive Survey. In: IEEE Access.
- [9]. M.Neyja, S.Mumtaz, K.M.S. Huq, S.A.Busari, J.Rodriguez and Z. Zhou (2017), An IoT-Based Health Monitoring System Using ECG Signal, IEEE Global communications conference, Singapore, 2017, pp. 1-6, doi:10.1109/GLOCOM.2017.8255023.
- [10]. K.K. Baseer, Neerugatti, V. ., M. Jahir Pasha, & V. D. Satish Kumar. (2020). Internet of Things: A Product Development Cycle for the Entrepreneurs. Helix - The Scientific Explorer | Peer Reviewed Bimonthly International Journal, 10(02), 155-160. Retrieved from <u>https://helixscientific.pub/index.php/home/article/view/126</u>
- [11]. Bhasha, P., Pavan Kumar, T., Baseer, K.K., Jyothsna, V. (2021). An IoT-Based BLYNK Server Application for Infant Monitoring Alert System to Detect Crying and Wetness of a Baby. In: Bhattacharyya, S., Nayak, J., Prakash, K.B., Naik, B., Abraham, A. (eds) International Conference on Intelligent and Smart Computing in Data Analytics. Advances in Intelligent Systems and Computing, vol 1312. Springer, Singapore. <u>https://doi.org/10.1007/978-981-33-6176-8\_7</u>
- [12]. Silpa, C., Niranjana, G., Ramani, K. (2022). Securing Data from Active Attacks in IoT: An Extensive Study. In: Manogaran, G., Shanthini, A., Vadivu, G. (eds) Proceedings of International Conference on Deep Learning, Computing and Intelligence. Advances in Intelligent Systems and Computing, vol 1396. Springer, Singapore. <u>https://doi.org/10.1007/978-981-16-5652-1\_5</u>
- [13]. K K Baseer, M Jahir Pasha, A.V.Rama Krishna Reddy, Kamarthi Rekha, M. Shaheda Begum, Sandhya E, "Smart Online Examination Monitoring System", Journal Of Algebraic Statistics, Volume 13, No. 3, 2022, p. 559-570.
- [14]. Jyothsna, V., Mukesh, D., Sreedhar, A.N. (2019). A Flow-Based Network Intrusion Detection System for High-Speed Networks Using Meta-heuristic Scale. In: Peng, SL., Dey, N., Bundele, M. (eds) Computing and Network Sustainability. Lecture Notes in Networks and Systems, vol 75. Springer, Singapore. <u>https://doi.org/10.1007/978-981-13-7150-9\_36</u>