

COVID-19 Patient Health Monitoring System

Anurag Tatkare, Hemangi Patil, Tejal Salunke, Shreya Warang, Dipak Marathe

A.C. Patil College of Engineering, Kharghar, 410210, India

E-mail: anuragtatkare@gmail.com, hemangipatil468, salunketejal97, warangshreya@gmail.com, dsmarathe@acpce.ac.in

Received: 20 July 2021; Accepted: 27 August 2021; Published: 08 October 2021

Abstract: The system proposed can be used to regular checkup of the COVID patients while maintaining the social distancing. Also, the data sensed by the sensors is directly sent to doctor, reducing the cost of paying regular visits to doctor. The Iot platform used in the system helps to transfer the real time patient's data remotely to host device. Daily health record can be maintained and can be viewed easily on graphs charts ease for doctors to see any abrupt changes in oxygen level or rise in temperature. To track the patient health micro-controller is in turn interfaced to an LCD display and wi-fi connection to send the data to the web-server (wireless sensing node). In case of any abrupt changes in patient heart-rate or body temperature alert is sent about the patient using IoT. This system also shows patients temperature and heartbeat tracked live data with timestamps over the Internet network.

Index Terms: Heart beat rate (BPM), Blood Oxygen (SpO₂), Pulse Oximeter, Temperature sensor, Internet of Things (IoT), Blynk.

1. Introduction

The world is facing pandemic situation due to Corona virus. This virus spreads easily even through normal human interactions. The increase in COVID patients has also led to decrease in the relative number of doctors per patient as a solution for this the patients with minor symptoms are home quarantined. In such situation maintaining personal health and immunity is very important for a home quarantined patient without being regularly monitored by the doctors. Recently, the patient monitoring systems is one of the major advancements because of its improved technology. Currently, there is need for a modernized approach. They need to visit the patient's ward for necessary diagnosis and advising. Firstly, the healthcare professionals must be present on site of the patient all the time and secondly, the patient remains admitted in a hospital, bedside biomedical instruments, for a period of time. The problem with this traditional approach is that there are chances of getting doctors and health personnel affected with the

COVID due to coming in contact with contagious patient. In order to solve these two problems, the patients are given knowledge. In order to improve the above condition, we can make use of technology in a smarter way. In recent years, health care sensors and advanced microcontrollers play a vital role to detect and monitor human body physiological parameters. In our system we to solve these two problems, the patients are given knowledge and information about disease diagnosis and prevention. Secondly, a reliable and readily available patient monitoring system is required. In order to improve the above condition, we can make use of technology in a smarter way. In recent years, health care sensors advanced microcontrollers play a vital role. Contact with the human body and monitor his or her physiological parameters. In our system we are measuring patient's parameters (temperature, heart rate, pulse, etc.) with different available sensors. These sensors collected data i.e., biometric information is given to raspberry pi and then it is transferred to server. In section II and III, Objective and Methodology of the project is discussed. Section IV consists of COVID Patient Health Monitoring Device design; simulation and its implementation are discussed. The results and discussions are mentioned in section V. Table1 shows the literature survey done.

2. Objective

The personal health monitoring of each individual is considered very important for a home quarantined patient. Moreover, the increase in COVID patients has also leads to decrease in the relative number of doctors per patient which results in vicious cycle where ignored or delayed diagnostics of an ailment makes the patient more dependent on doctor checkup. Though it is advisable to visit the doctor but as discussed above if the patient is home quarantined or if due to unavailability of specialist due to some reason, the health monitoring devices offer an effective alternative. Thus, there is need for software that utilizes the data available from the device, uploads it to the website, and gets feedback from doctors via internet and show health reports. Doctor should be able to get data anytime he wants for analysis. The health

monitoring device can record various data like patient’s heart beat rate, oxygen level; body temperature while in being in contact with the patient and this data from patient can be used by physicians to recommend any changes to patient’s routine and medicines.

The main objective is to design a Remote Patient Health Monitoring system to diagnose health condition of the patients without coming in close contact with the patient. Giving care and health assistant to a COVID patient in this pandemic situation has become one of major problems as the doctors, nurses, medical staff are also getting this virus due to coming in contact with contagious patient their lives are also in risks. Proper implementation of such health monitoring system can provide a safer way to diagnose a home quarantined patient where physical conditions of the patient can be monitored frequently, the need for cost effective and fast responding alert mechanism is inevitable. The Internet of Things (IoT) platform offers a promising technology to achieve the healthcare services, and can further improve the medical service systems. IoT wearable platforms can be used to collect the needed information of the patient and communicate such information wirelessly, where it is processed or stored for tracking the history of the patient.

3. Literature Survey

Table 1. Literature survey patient health monitoring system.

Ref.	Title	Author	Conclusion	Drawbacks
Int. Conf., March 2015	Design of Mobile Healthcare Monitoring System Using IoT Technology and Cloud Computing	Mustafa A Al-Sheikh and Ibrahim A Ameen	Capable to monitor more than one health parameter.	No proper layout of ECG. Unreliable.
Journal, March 2018	Monitoring of Patients Through Pulse & Heart Rate Sensor	Ajith, Praveen raj, Syed Ibrahim, Mr. Nagaraj	Measuring heart rate, temperature and oxygen level.	False Alarm generated in case of battery issue.
IEEE Journal, Sept. 2019	A Home Telemedicine System for Continuous Respiratory Monitoring	Alessandra Angelucci, David Kuller	Real time monitoring.	Less accurate and too expensive.
IEEE Journal, July 2020	Organic Multi-Channel Optoelectronic Sensors for Wearable Health Monitoring	Yasser Khan, Donggeon han, Jonathon Ting	Only oxygen level detection.	Lacks wireless communication and temperature sensor.
IEEE Journal, Oct 2018	A Wearable Pulse Oximeter with Wireless Communication and Motion Artifact Tailoring for Continuous Use	Pedro J. Chacon, Tallis H. da Costa, Taher Ghomian,	Oxygen level in low noise detected.	Bluetooth network used. No temperature sensor
Int. Conf., March 2018	Synchronized Intermittent Mandatory Ventilation Mode Control Using Pulse Oximeter	Tassadaq Hussain, Amna Haider, Wasim Akram	Different oximeter techniques discussed.	Only oxygen level measuring technique discussed.

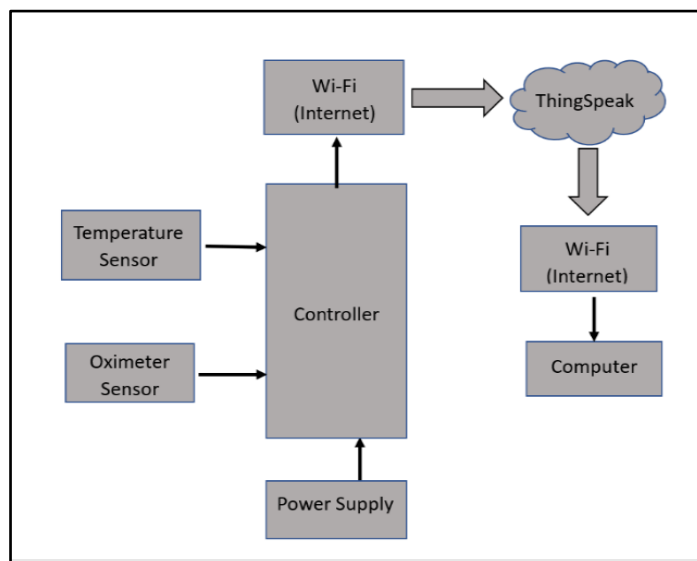


Fig. 1. Block diagram of covid patient health monitoring system



Fig. 5. Blynk App Window Diagram for covid patient health monitoring system.

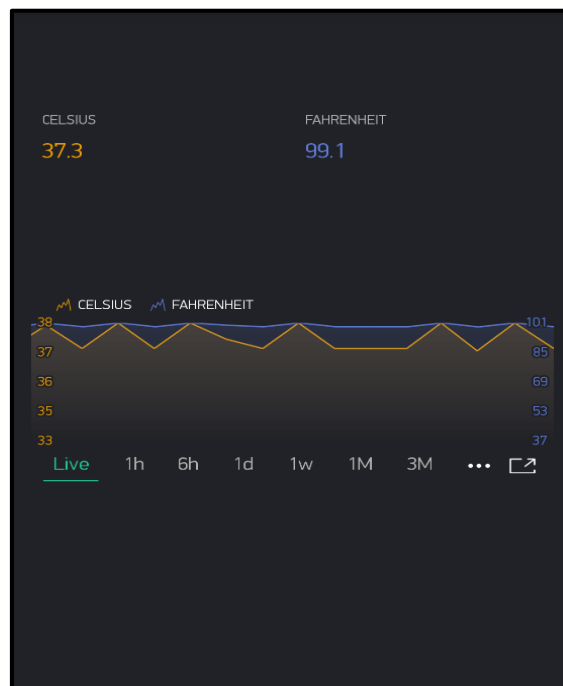


Fig. 6. LM35 Output displayed on Blynk



Fig. 7. MAX30100 Pulse Oximeter Output displayed on Blynk.

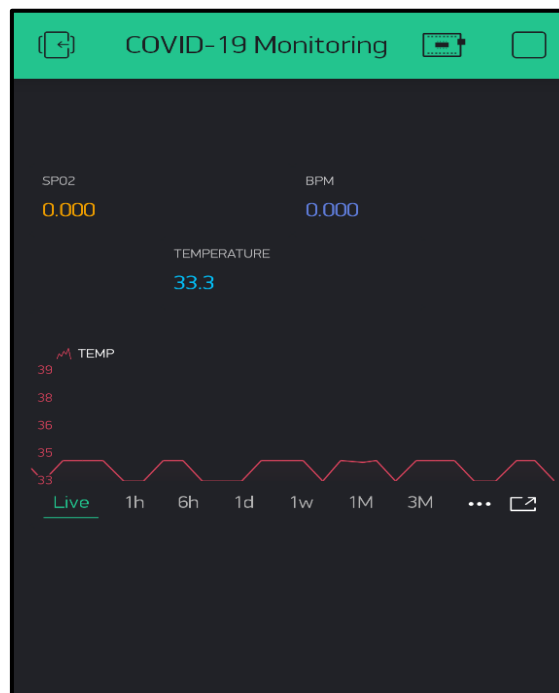


Fig. 8. LM35 Temperature decrement observed in cold condition.



Fig. 9. LM35 Temperature increment observed in hot condition.

7. Conclusion

The system introduced COVID-19 patient health monitoring system monitors the basic important signs of patient like heart rate and body temperature. Authenticate medical staff can view and track the data in real time even though the patients perform the test outside the hospital. The developed prototype is very simple to design and use. The developed system will improve current health care system that may protect lots of lives from death.

The early identification of any health problem can help the patient to take necessary emergency measures, which can potentially save the patient's life. IoT can help in this regard. IoT based health monitoring systems can monitor the patients in real-time and warn the patient of any abnormalities. The idea of a smart health monitoring system using the IoT architectures is a novel contribution in the field of medical science and it will reduce health issues and unwanted deaths.

References

- [1] M. A. Mahgoub, O. O. Khalifa, K. Sidek, S. Khan, "Health monitoring system using Pulse Oximeter with remote alert", March 2015, International Conference on Computing, Control, Networking, Electronics and Embedded Systems Engineering.
- [2] M. Shiekh and I. Ameen, "Design of mobile healthcare monitoring system using IoT Technology and Computing", Sept. 2020, 3rd Int. Conf. on Sustainable Engineering Techniques
- [3] Y. Khan, D. han, J. Ting, A. C. Aris "Organic Multi-Channel Optoelectronic Sensors for Wearable Health Monitoring", Published in IEEE Access (Volume 7), pp. 128114-128124, September 2019.
- [4] A. Angelucci, D. Kuller, A. Aliverti, "A home telemedicine system for continuous respiratory monitoring", IEEE J Biomed Health Inform, Jul 2020.
- [5] P. J. Chacon, T. H. da Costa, T. Ghomian, H. Chun Wu, "A Wearable Pulse Oximeter with Wireless Communication and Motion Artifact Tailoring for Continuous Use", IEEE Transactions on Biomedical Engineering (Volume 66, issue 6), pp. 1505-1513, October 2018.
- [6] T. Hussain, A. Haider, W. Akram, M. Rehman, "Synchronized intermittent mandatory ventilation mode control using pulse oximeter", March 2018, International Conference on Computing Mathematics and Engineering Technologies (iCoMET).
- [7] Deepesh K Rathore; Ankita Upmanyu; Deepanshu Lulla "Wireless patient health monitoring system" 2013 International Conference on Signal Processing and Communication (ICSC).
- [8] Shola Usha Rani, Antony Ignatious , Bhava Vyasa Hari, Balavishnu V J "Iot Patient Health Monitoring System" Indian Journal of Public Health Research and Development -October 2017.
- [9] C. Premalatha, R.P. Keerthana, R. Abarna "HUMAN HEALTH MONITORING SYSTEM" International Research Journal of Engineering and Technology. (Volume: 06 Issue: 01) Jan 2019.
- [10] Pedro J. Chacon, Limeng Pu, Tallis Costa "A Wearable Pulse Oximeter With Wireless Communication and Motion Artifact Tailoring For Continuous Use" IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING (VOL. 66, NO. 6), JUNE 2019.
- [11] <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-covid-19#:~:text=symptoms>

- [12] <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-covid-19#:~:text=protect>
- [13] MAX30100 Pulse Oximeter and Heart-Rate Sensor IC for Wearable Health Data Sheet.
- [14] NodeMCU ESP-32 Microcontroller Data Sheet

Authors' Profiles



Anurag Tatkare, B.E. and Diploma in Electronics & Telecommunication, and Diploma in Embedded System. JES, A.C.Patil College of Engineering ,Kharghar, Navi-Mumbai-410210. University of Mumbai.



Hemangi Patil, B.E. Electronics and Telecommunication JES, A.C.Patil College of Engineering ,Kharghar, Navi-Mumbai-410210. University of Mumbai.



Shreya Warang, B.E. Electronics and Telecommunication JES, A.C.Patil College of Engineering ,Kharghar, Navi-Mumbai-410210. University of Mumbai.



Tejal Salunke, B.E. Electronics and Telecommunication JES, A.C.Patil College of Engineering ,Kharghar, Navi-Mumbai-410210. University of Mumbai.



Dipak S. Marathe has submitted his Ph. D Thesis to University of Mumbai, and received the M. Tech. in Electronics from VJTI, Mumbai. He is currently Associate Professor in Electronics and Telecommunication Department at A. C. Patil College of Engineering, Navi-Mumbai, and Maharashtra, India. His research interests include Analog and Digital CMOS VLSI Design, and Wireless Communication.

How to cite this paper: Anurag Tatkare, Hemangi Patil, Tejal Salunke, Shreya Warang, Dipak Marathe, " COVID-19 Patient Health Monitoring System ", International Journal of Engineering and Manufacturing (IJEM), Vol.11, No.5, pp. 48-55, 2021. DOI: 10.5815/ijem.2021.05.05