

COVID PATIENT HEALTH MONITORING USING INTERNET OF THINGS

Mr.B.S.Vara Prasad¹, P. Lakshmi Thirupathamma², P.Venu sri³, V. Yamini⁴, B. Harindra⁵

Abstract : With the COVID-19 cases on the rise this project seems to effectively provide a cost effective and accurate solution for the diagnosis of the novel corona virus among the mass public. This research paper presents the design and implementation of an IoT based project that is capable of recording the user's vitals such as Pulse rate, SpO2 and Temperature, all of which serve as important indicators of the novel corona virus.

Once recorded, the sensors then send the data over to the Arduino UNO micro controller which in turn pushes it to private cloud server using a Wi-Fi module wherein the data can be used for various analysis and visualizations such as scatter plot, histograms and so on. A website then shows the entries made using the micro controller along with the latest COVID-19 statistics and WHO guidelines that have been provided.

The results at the prototype stage look really promising and provide a foundation for the project to be scaled upon on a larger scale since the project helps us to curb the virus by introducing viable monitoring methods which can serve as replacements to the traditional and more expensive alternatives.

Keywords: IOT web server, MAX30100 sensor, Temp Sensor, Arduino uno, Esp32,

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I. INTRODUCTION

The numbers of COVID-19 cases in the world are still on the rise and the only logical way to tackle the problem. The virus has greatly caused economic and social disruption which is devastating. As of March 2021, the virus has led to 117 million cases and 2.7 million deaths worldwide, out of which 158 thousand deaths are from India Corona virus disease (COVID-19) is an infectious disease caused by the group of related RNA viruses. The main cause of transmission of the virus is through droplets generated when an infected person cough, sneezes or exhale.

The Internet of Things is considered now as one of the feasible solutions for any remote value tracking especially in the field of health monitoring. Internet of Things (IoT) development brings new opportunities in many applications, including smart cities and smart healthcare.

Currently, the primary usage of the IoT in healthcare can be categorized as remote monitoring and real-time health systems. Controlling and managing dire situations, such as the one in 2020 when the corona virus disease (COVID-19) took over the world, can be achieved with the help of IoT systems, without imposing severe restrictions on people and industries.

Remote patient monitoring allows you to stay connected with the patient beyond an initial virtual visit or screening. It allows you to monitor changes in symptoms or underlying health conditions and risk factors with surveys and connected devices, and to provide educational content. It enables your care team to follow protocols to intervene timely and appropriately as the patient's condition changes.

The system involves a mobile app, will provide the patient a health monitoring kit to monitor his or her parameters regularly. Patient health parameters, along with patient location, are uploaded on a regular basis on to a centralized command and control center on cloud using either the patient's mobile phone or who take care of that person through wifi.

II. PROBLEM STATEMENT

In times of covid we have special Covid 19 Quarantine centers setup in order to treat covid patients. Since covid is highly infectious it is very important to quarantine covid patients but at the same time doctors need to monitor health of covid patients too. With the increasing number of cases it is becoming difficult to keep a track on the health conditions of so many quarantined patients.

The problems here are:

- Doctors need to regularly monitor patient health.
- There are increasing number of patients for the doctors to monitor.
- The doctors are at risk of infection just for monitoring purpose.

To solve this issue we are here design a remote IOT based health monitor system that allows for remotely monitoring of multiple covid patients over the internet. The system monitors patient pulse rate, temperature and oxygen levels by using infrared temperature sensor and Max30100 sensor respectively.

The system then transmits this data over the internet using Wi-Fi transmission by connecting to Wi-Fi internet connection. The data is transmitted and received over IOT by IOT Gecko platform to display data of patient remotely. The entire system is run by a Microcontroller based circuitry. If any anomaly is detected in patient presses the emergency help button on IOT device, an alert is sent over IOT remotely.

III. MOTIVATION

The provision of services through assisted means enables a comfortable and convenient lifestyle. The primary role of any smart home automation system is to assist users in remotely controlling and monitoring appliances. With this in mind, we are motivated to develop a system that not only controls and monitors the home but also supports an improved healthy lifestyle of users.

Smart home automation as an emerging area of IoT has been applied in various areas such as easy and assisted daily living especially for the provision of support to humans, remote control of home appliances, detection of movement in the house, energy management in the home and security, and provision of healthcare services to out-patients, disabled and elderly persons.

Positive patients with mild symptoms are advised to observe quarantine. The self-isolation or quarantine can be observed from home while the affected person sends signs or symptoms of any ailment observed to the doctor at regular intervals. To this end, we are motivated to broaden the scope of the smart home healthcare system to accommodate the upload of symptoms affected by COVID-19 from the comfort of their respective homes.

IV. PROPOSED SYSTEM

The Proposed system consists of a robust micro controller prototype that contains various sensors used to measure the user's vitals such as pulse rate, SpO2 and temperature. Once collected, the data is sent to the micro controller (Arduino-UNO) which is responsible for forwarding the data to the connected Wi-Fi module.

The design and implementation of an IOT based project is capable of readings the users vitals such as pulse rate, SpO2, temperature. System transmits the data over the internet using Wi-Fi transmission.

A device is to be made by using Arduino which is as micro controller with Wifi feature, temperature, heartbeat and blood pressure sensors. The rechargeable battery is used in device to supply power. Micro controller can be connected to internet through Wifi using Wifi modem or mobile hotspots. Micro controller sends the sensor data through Wifi to internet which can be seen on cloud server anywhere in the world.

The proposed design was achieved through a combination of WS circuits and smartphone technologies via an Arduino circuit. The circuits acquired and computed the body data using an Arduino, which performed primary data collection. An electronic interface connected the Arduino circuits to the smartphone application to monitor, analyze, process, and transmit the data. The data were ensured and secured for intended persons only.

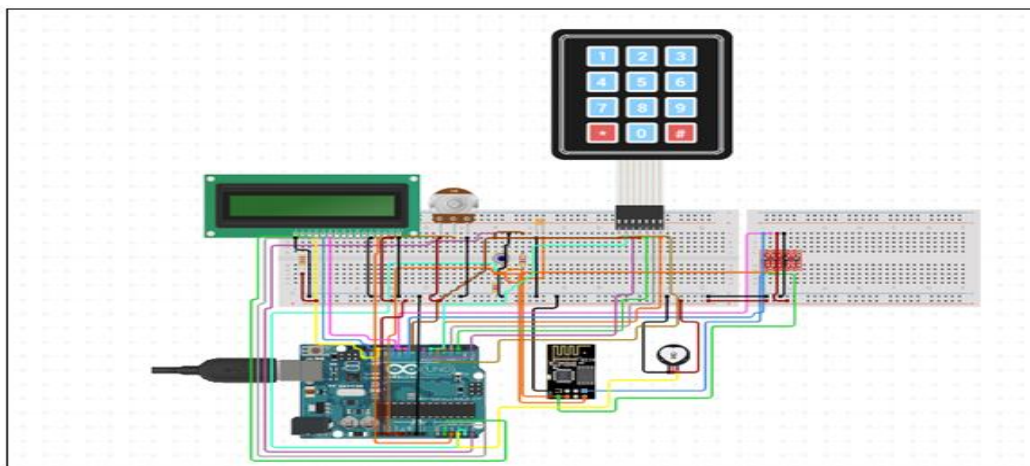
V. RELATED WORK

The cloud server is a feature of the system that allows the doctor to record the patient's information, input notes for advice, prescription allowing the patient to key in measured psychological parameter values and display of information received from the doctor. Smart TV application was used for reminding patients daily about their activities, medications and other events.

VI. OUR PROJECT DESCRIBED A REMOTE COVID PATIENT HEALTH MONITORING SYSTEM FOR THE COLLECTION OF PULSE RATE, TEMPERATURE AND OXYGEN LEVEL VALUES FROM PATIENTS THROUGH MOBILE PHONES. VALUES RECORDED ON MOBILE PHONES ARE SUPPLIED AND DISPLAYED TO DOCTORS OR CARE GIVERS THROUGH THE CLOUD INTERFACE IN THE SYSTEM.

VII. IMPLEMENTATION

The implementation of the system revolves around enhancing and improving the design of its predecessor by not only making it a more efficient and sophisticated system, but also ensuring that we make the system economically viable to serve as a solution. The system basically involves the collection of vitals from the user by means of dedicated sensors and uploading them to cloud server via Wi-Fi module and analysis. The vitals can also be observed via a web server that not only publishes the result of the vital records but also provides some important WHO COVID-19 guidelines.



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The circuit diagram gives us a basic idea of the circuit layout of the system. The hardware used in the system contains the components mentioned in given below.

S.No	Components	Use
1	MAX30100	Detect pulse rate, Spo2
2	MLX90614	Detect temperature
3	Arduino-uno	Brain of the system
4	Esp32	Sending data to cloud

A. Arduino uno

The **Arduino Uno** is an open-source micro controller board based on the Microchip ATmega328P micro controller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output(I/O) pins that may be interfaced to various expansion boards (shields) and other circuits the board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.

The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino software. The Uno board is the first in a series of USB-based Arduino boards .

B. FEASIBILITY ANALYSIS

An important outcome of preliminary investigation is the determination that the system request is feasible. This is possible only if it is feasible within limited resource and time. The different feasibilities that have to be analysed are

C. OPERATIONAL FEASIBILITY

Operational Feasibility deals with the study of prospects of the system to be developed. This system operationally eliminates the manpower and effectively tracking the project progress. This kind of automation will surely reduce the time and energy, which previously consumed in manual work. Based on the study, the system is proved to be operationally feasible.

D. ECONOMIC FEASIBILITY

Economic Feasibility or Cost-benefit is an assessment of the economic justification for a computer-based project. As hardware was installed from the beginning & for lots of purposes thus the cost on project of hardware is low. Since the system is an ML based, so the project is economically feasible.

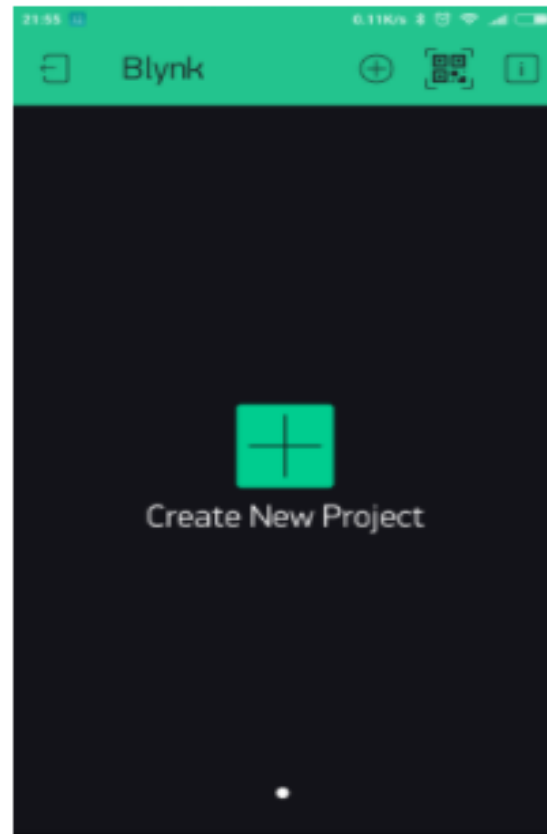
E. TECHNICAL FEASIBILITY

Technical Feasibility is the assessment of the technical resources of the organization. The organization needs MIT App inventor online tool which consist languages of blocks code. The technical feasibility has been carried out. The system is technically feasible for development and can be developed with the existing facility.

VIII. SOFTWARE

USER MODULES

The **Blynk app** is really an app editor. It allows you to create one or more projects. Each project can contain graphical widgets, like virtual LEDs, buttons, value displays and even a text terminal, and can interact with one or more devices.



TESTING STRATEGY

A strategy for system testing integrates system test cases and design techniques into a well- planned series of steps that results in the successful construction of software. The testing strategy must co-operate test planning, test case design, test execution, and the resultant data collection and evaluation .A strategy for software testing must accommodate low-level tests that are necessary to verify that a small source code segment has been correctly implemented as well as high level tests that validate major system functions against user requirements. Software testing is a critical element of software quality assurance and represents the ultimate review of specification design and coding. Testing represents an interesting anomaly for the software. Thus, a series of testing are performed for the proposed system before the system is ready for user acceptance testing.

A. TESTING

Testing is that the method of attempting to get each conceivable fault or weakness in an exceedingly work product.

B. ACCEPTANCE TESTING

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements. Test Results: All the test cases mentioned above passed successfully. No defects encountered.

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X. CONCLUSION

The main aim of the project is to provide a prototype which acts as a COVID-19 countermeasure by slowing down the spread. It is not only an informative project but also acts as a diagnostic tool that can be used to curb the virus. The project not only promises a certain degree of accuracy but does so at a fraction of its predecessors.

The system is mounted at patient bedside and constantly transmits patient health data over the internet so that doctors can monitor multiple patients remotely and attend the desired patient urgently when needed.

The system monitored body temperature, pulse rate and oxygen level, which are also displayed on a IOT cloud. These sensor values are then sent to a medical server using wireless communication. These data are then received in an authorized personal smart phone with IoT platform. With the values received the doctor then diagnoses the disease and the state of health of the patient.

REFERENCES

1. Mohammed MN, Syamsudin H, Al-Zubaidi S, Karim SRR, Yusuf E. Novel COVID-19 detection and diagnosis system using IOT based smart helmet. *Int J Psychosoc Rehabil*. 2020; 24(7): 2296- 2303.
2. Priambodo R, Kadarina TM. Monitoring Self-isolation Patient of COVID-19 with Internet of Things. 2020 IEEE International Conference on Communication, Networks and Satellite. 2020; 87-91.
3. Hasan MW. Covid-19 fever symptom detection based on IoT cloud. *Int J Electr Comput Eng*. 2021; 11(2): 1823.
4. Arun M, Baraneetharan E, Kanchana A, Prabu S. Detection and monitoring of the asymptomatic COVID-19 patients using IoT devices and sensors. *International Journal of Pervasive Computing and Communications*. 2020.
5. Abdullah A, Ismael A, Rashid A, Abou-ElNour A, Tarique M (2015) Real time wireless health monitoring application using mobile devices. *Int J Comput Net w Commun (IJCNC)* 7(3):13, May 2015.
6. Shelar M, Singh J, Tiwari M (2013) Wireless patient health monitoring system. *Int J ComputAppl* (0975–8887) 62(6):1, Jan 2013
7. Hossain SM. Patient status monitoring for smart home healthcare. In: IEEE international conference on multimedia and expo workshop. Seattle: ICMEN; 2016
8. Kumar GV, Bharadwaja A, Sai NN. Temperature and heart beat monitoring system using IOT. 2017 international conference on trends in electronics and informatics. 2017; 692-695.