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Development of Remote Health Monitoring System for Patients using IoT

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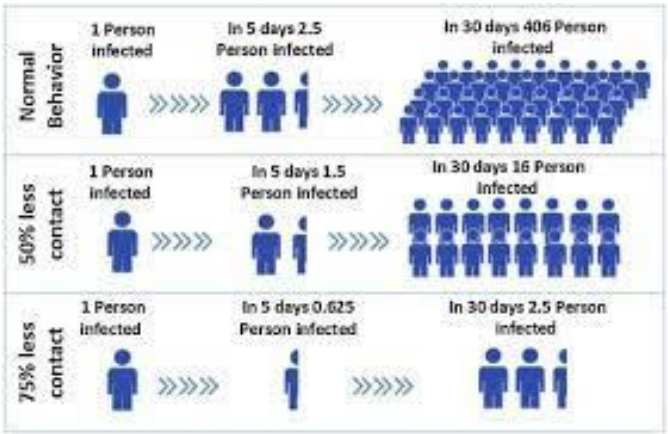
Abstract: *According to the constitutions of the World Health Organization (WHO), the highest attainable standard of health is a fundamental right for an individual. As we are truly inspired by this, we attempt to propose an innovative system that puts forward a smart patient health tracking system. This paper extends the author's previous works by instantiating the Reference Architecture for IoT-based. Healthcare Applications (RAH) for healthcare applications for the context of the COVID-19 outbreak. We show how wearable and unobtrusive sensors can be integrated into the proposed platform and used to collect and process patient data to promote rapid clinical interventions while preventing contagion between clinical staff and infected patients. Finally, we report the results from a real experience, which used our approach to develop and deploy a system used by the intensive care unit (ICU) for COVID-19 patients in Brazil. Therefore, this paper aims to extend the platform proposed in, initially designed for patients' de-hospitalization, by including wearable and unobtrusive sensors to monitor patients with coronavirus disease.*

Keywords: Health Monitoring

I. INTRODUCTION

IoT is a technology that enables to monitoring of patients without any physical contact with the patients. which may increase the access to care and decrease healthcare delivery costs. This can significantly improve an individual's quality of life. COVID-19 belongs to the family of coronavirus caused diseases, initially reported at Wuhan, China, during late December 2020. On March 11, it spread over 114 countries with 118,000 active cases and 4000 deaths, WHO declared this a pandemic [1], [2]. On May 4, 2020, over 3,519,901 cases and 247,630 deaths had been reported worldwide. Several healthcare organizations, medical experts and scientists are trying to develop proper medicines and vaccines for this deadly virus, but till date, no success is reported. This situation forces the global community to look for alternate ways to stop the spread of this infectious virus. Social distancing is claimed as the best spread stopper in the present scenario, and all affected countries are locked-down to implement social distancing.



Many healthcare organizations, scientists, and medical professionals are searching for proper vaccines and medicines to overcome this deadly virus, although no progress is reported to-date. To stop the virus spread, the global community is

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looking for alternate ways. The virus mainly spreads in those people; who are in close contact with each other (within 6 feet) for a long period. The virus spreads when an infected person sneezes, coughs, or talks, the droplets from their nose or mouth disperse through the air and affect nearby peoples. The droplets also transfer into the lungs through the respiratory system, where it starts killing lung cells. Recent studies show that individuals with no symptoms but are infected with the virus also play a part in the virus spread.

II. LITURATURE SURVEY

Nguyen et al. (2020) provides a survey of different emerging technologies, including Wi-fi, Bluetooth, smartphones, and GPS, positioning (localization), computer vision, and deep learning that can play a crucial role in several practical social distancing scenarios. Some researchers utilize drones and other surveillance cameras to detect crowd gatherings.

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We conducted systematic reviews of the evidence base for effectiveness of multiple mitigation measures: isolating ill persons, contact tracing, quarantining exposed persons, school closures, workplace measures/closures, and avoiding crowding. Evidence supporting the effectiveness of these measures was obtained largely from observational studies and simulation studies. Voluntary isolation at home might be a more feasible social distancing measure, and pandemic plans should consider how to facilitate this measure. More drastic social distancing measures might be reserved for severe pandemics.

Ainslie et al. (2020) investigated the relationship between the region's economic situation and the social distancing strictness. The study revealed that moderate stages of exercise could be allowed for evading a large outbreak. So far, many countries have used technology-based solutions.

III. PROBLEM DEFINITION

There is a growing trend in the medical field to minimize the need for hospitalization, moving several health care procedures from hospitals (hospital-centric) to patient's homes (home-centric). This strategy has been praised mainly due to its potential for improving patient's wellness and treatment effectiveness for a wide range of health conditions. It can also reduce the costs of the public health system worldwide and its efficiency, which in the last decade has been challenged by the population aging and the rise of chronic diseases. Furthermore, the current COVID-19outbreak has exposed the importance of rapidly scaling the health system and keeping home patients who are at high-risk but not severe enough to stay hospitalized. Internet of Things (IoT) provides the scalability required for this purpose, supporting continuous and reliable health monitoring on a global scale. This paradigm is increasingly becoming a vital technology in healthcare. Furthermore, the recent progress in low-power consumption, miniaturization, and biosensors has revolutionized the process of monitoring and diagnosing health conditions, bringing comfort, personalization, and effectiveness through unobtrusive healthcare devices.

IV. EXISTING SYSTEM

The system used for health monitoring is the fixed monitoring system, which can be detected only when the patient is in hospital or bed. In the existing system, patients need to get hospitalized for regular monitoring, where either the nurse or the doctor has to move physically for a health check, which may not be possible to monitor their conditions continuously. It is not possible once he/she is discharged from the hospital. Thus, any critical situation cannot be identified easily unless the nurse or doctor checks the person's health at that moment. This may be a strain for the doctors who have to take care of a lot of people in the hospital. Also, when medical emergencies happen to the patient, they are often unconscious and unable to press an Emergency Alert Button.

V. DISADVANTAGES OF EXISTING SYSTEM

Although the Internet of Things can be of great benefit to healthcare, there are still major challenges to address before full-scale implementation. The threats and disadvantages of using connected devices in healthcare are as follows:

1. **Security and privacy**: Security and privacy remain a major concern deterring users from using IoT technology for medical purposes, as healthcare monitoring solutions have the potential to be breached or

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hacked. The leak of sensitive information about the patient's health and location and meddling with sensor data can have grave consequences, which would counter the benefits of IoT.

2. **Risk of failure**: Failure or bugs in the hardware or even power failure can impact the performance of sensors and connected equipment placing healthcare operations at risk. In addition, skipping a scheduled software update may be even more hazardous than skipping a doctor checkup.
3. **Integration**: There's no consensus regarding IoT protocols and standards, so devices produced by different manufacturers may not work well together. The lack of uniformity prevents full-scale integration of IoT, therefore limiting its potential effectiveness.
4. **Cost**: While IoT promises to reduce the cost of healthcare in the long-term, the cost of its implementation in hospitals and staff training is quite high.
5. **Emergencies**: The patient should visit the doctor or nurse when he/she is not feeling well, which may be difficult in every situation.

VI. PROPOSED SYSTEM

Keeping track of the health status of your patient at home is a difficult task because of the busy schedules and our daily life work. Specially old age patients should be periodically monitored. So we propose an innovative system that automates this task with ease. Our device puts forward a smart patient health tracking system using an IoT server. The IoT server used here is ThingSpeak. So that the Patient health parameters like Heart Rate along with Body Temperature can be monitored

The system is implemented using the combination of hardware components. All the hardware components are assembled in the implementation phase. The circuit diagram of the developed system is demonstrated in Fig. 1.3. All the sensors are connected with ESP32 using physical pins. ESP32 is used as a processing device as it has a built-in Wi-Fi module. For all sensors, the *V*cc and GND are connected with the *V*cc and GND pin of ESP32. In the case of the heart beat sensor, the signal pin is connected with the D26 pin of ESP32. The data pin of LM35 is mapped with the D35 pin of the microcontroller (ESP32). These are the case with a specific patient. For room condition monitoring, the data pin of DHT11 is linked with ESP32's D14 pin. In the implementation, DHT11 is only considered for room humidity measurement. The digital outpin of MQ-9 and MQ-135 are connected with D27 and D34 of ESP32, respectively, for the measurement of toxic gasses in room environment.

The user prototype is depicted in a figure where the system is tested with one user. Figure 1.3 is the block diagram that explains IoT based Health Monitoring System using Wi-fi module (ESP8266) & Arduino, Pulse Sensor and Temperature Sensors measures BPM & Environmental Temperature respectively. The Arduino processes the code and displays to 16*2 LCD Display. ESP8266 Wi-fi module connects to wifi and sends the data to the IoT device server. The server used here is Thingspeak. The data can be monitored fro any part of the world by logging into the ThingSpeak channel.

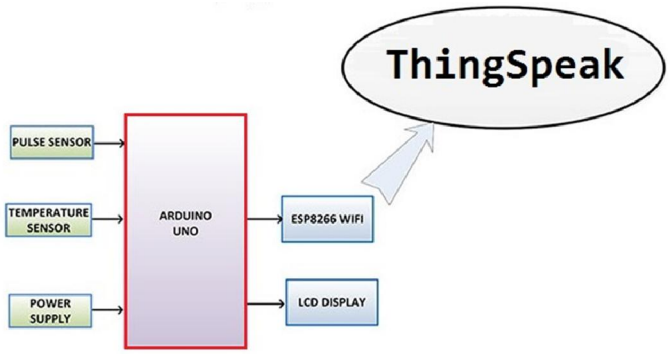

Figure: Architecture of the Proposed System

6.1 Advantages of Proposed System

The following are the advantages of proposed system:

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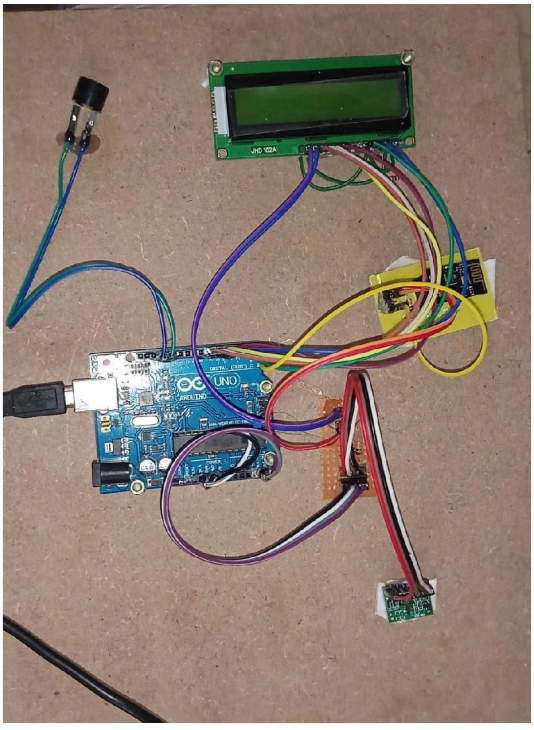
1. **Remote monitoring:** Real-time remote monitoring via connected IoT devices and smart alerts can diagnose illnesses, treat diseases and save lives in case of a medical emergency.
2. **Reduction of healthcare costs:** IOT reduces costly visits to doctors and hospital admissions and makes testing more affordable.
3. **Medical data accessibility:** Accessibility of electronic medical records allow patients to receive quality care and help healthcare providers make the right medical decisions and prevent complications.

VII. IMPLEMENTATION

The modules present in our project are:

- **DATA COLLECTION:** The data will be collected from patients through various sensors like pulse sensor and temperature sensor. The collected data will be sent to the ThingSpeak platform to monitor health status.
- **TEMPERATURE SENSOR:** A temperature sensor is selected for the health monitoring system terminal and the hardware circuit is designed. The digital conversion of the output analog signal is realized through the display.
- **PULSE SENSOR:** The photoelectric pulse sensor is divided into two types: transmitted wave monitoring and reflected wave monitoring according to how to detect light. Their key components are the same (i.e., stable light source and light-receiving sensor).
- **WORKING :**The connections between the sensors, wifi module and microcontroller are shown, as is the connection between the microcontroller and a device using a USB. Also, the data is received in the ThingSpeak IoT platform, and the respective output is shown in that platform. The circuit is mainly made with an Arduino Uno and two sensors that can measure two human body parameters. A 5 V power supply powers the sensors, LCD display, and microcontroller. The microcontroller is connected to a laptop using a USB that sends commands to the sensors. There is also a Wifi module that helps to read data from the system.

7.1 Sample Results



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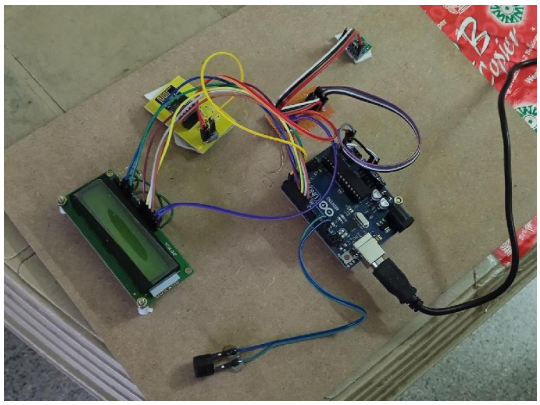

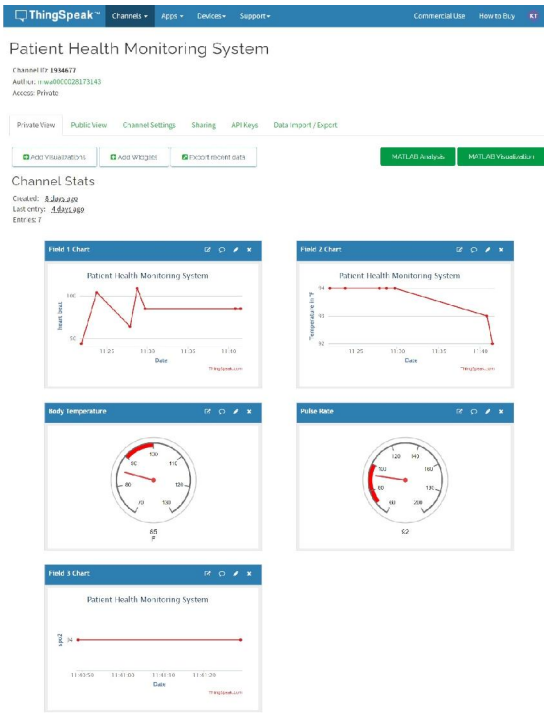

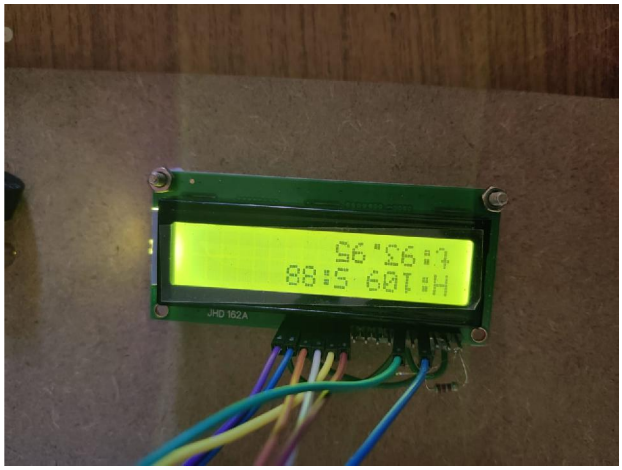

VIII. CONCLUSION

This paper aims to extend the platform proposed in, initially designed for patients' de-hospitalization, by including wearable and unobtrusive sensors to monitor patients with coronavirus disease. This IoT-based device allows users to

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determine their health parameters, which could help regulate their health over time. Eventually, the patients could seek medical assistance if the need arises. They could easily share their health parameter data instantly within one application with the doctor. As we know, the IoT is now considered one of the most desirable solutions in health monitoring. It makes sure that the parameter data is secured inside the cloud, and the most important thing is that any doctor can monitor the health of any patient at any distance. The paper is about an IoT-based health monitoring system using Arduino that has been developed.

REFERENCES

[1]. S. Jaiswal, R. Katake, B. Kute, S. Ranjane, and P. D. Mehetre, "Survey of Health Monitoring Management Using Internet of Things (IOT)," Int. J. Sci. Res., vol. 5, no. 11, pp. 2243–2246, 2017.

[2]. S. Jayapradha; P.M Durai Raj Vincent. An IOT based Human healthcare system using Arduino Uno board. Associate Professor, SITE, VIT University, Vellore, Tamil Nadu.

[3]. Pratiksha W. Digarse; Sanjaykumar L. Patil,"Arduino UNO and GSM based wireless health monitoring system for patients", IEEE, Madurai, India, 11 January 2018

[4]. Anirvin Sharma; Tanupriya Choudhury; Praveen Kumar,"Health Monitoring & Management using IoT devices in a Cloud Based Framework" of IEEE Conference, Paris, France, 2018

[5]. D. Shiva Rama Krishnan; Subhash Chand Gupta; Tanupriya Choudhury,"An IoT based Patient Health Monitoring System", IEEE, Paris, France, 2018

[6]. Yogesh Pandurang Pardhi1 , Prof.Shubhangi Borkar2 PG Student [M.E. (ESC)], Dept. of CSE, N.I.T.Nagpur, "A Survey on Patient's Health Monitoring System in Real Time", IJAREEIE, Vol. 6, Issue 6, June 2017.