AN IOT-BASED HEALTHCARE PLATFORM FOR PATIENTS IN ICU BEDS DURING THE COVID-19 OUTBREAK

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ABSTRACT

Intensive Care is where the patients who are critically ill are admitted for treatment. For such critical conditions the Doctors need to have an all-time update patient's health related parameters like their blood Heart pulse, heart beat and temperature. To do manually, this is too tedious a task and also for multiple patients it becomes close to impossible. For this type of situation, this IOT-based system can bring about automation that can keep the Doctors updated all time on the internet. There is a global concern with the escalating number of patients at hospitals caused mainly by population aging, chronic diseases, and recently the COVID-19 outbreak. To smooth this challenge, IOT emerges as an encouraging paradigm because it provides the scalability required for this purpose, supporting continuous and reliable health monitoring on a global scale. Based on this context, an IOT-based healthcare platform provides remote monitoring for patients in critical situations.

Keyboard: IOT, COVID-1.

I. INTRODUCTION

IOT Based Patient Monitoring System is a Microcontroller based system which collects patient's information with the help of few sensors. It uses Wi-Fi module to communicate this information to the internet There is this Temperature and heart beat monitor module electrically connected to the system and physically to be worn by the user. With the press of a button, the sensor senses the temperature in systolic and diastolic along with heartbeat and blood pressure and ends it to the central controller.

The Temperature sensor senses the temperature of its ambiance, so when this sensor is in close proximity to the user it reports the user's body temperature. Thus, the doctor can get access to these vital parameters pertaining to the patients' health over the IoT interface from anywhere in the world. In this way IOT Based ICU Patient Monitoring System is an enhanced system that helps in monitoring ICU Patients without any manual intervention 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.

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II. LITERATURE SURVEY

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 home (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-19 outbreak has exposed the importance of rapidly scaling the health system and keeping at-home patients who are high-risk but not severe enough to stay hospitalized.

The non-functional requirements described in the projects are scalability, reliability, ubiquity, portability, interoperability, robustness, performance, availability, privacy, integrity, authentication, and security When it comes to protocols, the data collected from the studies showed two protocols categories: communication, concerning network protocols, and application, about data transfer protocols few frameworks regarding healthcare IOT-based monitoring can be found in the literature. These proposals can encapsulate a large variety of technologies such as cloud computing and fog computing. Following, we detail some of these works.

IOT-Based Patient Monitoring System is a Microcontroller-based system that collects patient's information with the help of a few sensors. It uses Wi-Fi module to communicate this information to the internet. There is this Temperature and heartbeat monitor module electrically connected to the system and physically to be worn by the use with the press of a button, the sensor senses the temperature in systolic and diastolic along with the heartbeat and blood pressure and sends it to the central controller.

Design Issues and Requirements:

Proposed IoT-based healthcare platform's primary goal is to provide remote monitoring for patients in a critical situation. This platform is IoT based and integrates patients, physicians, and ambulance services to promote better care and fast preventive and reactive urgent actions. It addresses challenges like interoperability, security, performance, and availability.

Regarding requirements, this platform has *Remote Patient and Environment Monitoring, Patient Healthcare Data Management, Patient Health Condition Management, and Emergency and Crisis Management*.

The *Remote Patient and Environment Monitoring* involves the acquisition of data from sensors attached to the patient's body and in the environment (patient's home or ICU). The data acquired from the sensors are used by clinical staff (physician and nurses) for healthcare treatment and emergency alert purposes. Thus, the sensors attached to the patient's body provide information about ECG, blood pressure and glucose, heart rate, oxygen saturation, temperature, breathing rate, and capnography. The environment sensors provide information about environment temperature, location with latitude and longitude, and humidity. This is important because controlling the environment's temperature and humidity can directly affect the patient's treatment. Regarding the location, it assists in the rapid response of the ambulance service. Therefore, since the patient in critical condition is at home and not in a hospital, which is a more controlled environment, this ambient information is of greater importance for effective healthcare and enriches the remote monitoring provided by this platform.

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The *Patient Healthcare Data Management* records the patient's data: name, gender, date of birth, contacts, address, family information, physician information (name and contacts), health insurance information, health situation, and the history of monitoring sensors and emergency alerts. These The methodology used to develop PAR. data are essential for physicians and nurses to understand patients' current situation and history and facilitate the accurate monitoring of health treatment. The *Patient Health Condition Management* considers the patient's healthcare data, especially the health situation and history of the sensors' monitoring data, to allow of critical level values for the sensors, which are important to enable the rapid response in case of an emergency. It also denes rules to actions considering the settled critical levels for a patient and the related alerts. Finally, the *Emergency and Crisis Management* address information about the patient's health condition and the services that should be alerted in case of an emergency with a monitored patient in a critical situation. Since this patient is at home and not in a hospital, the efficiency of a rapid response in an emergency case can be the deciding factor between life and death.

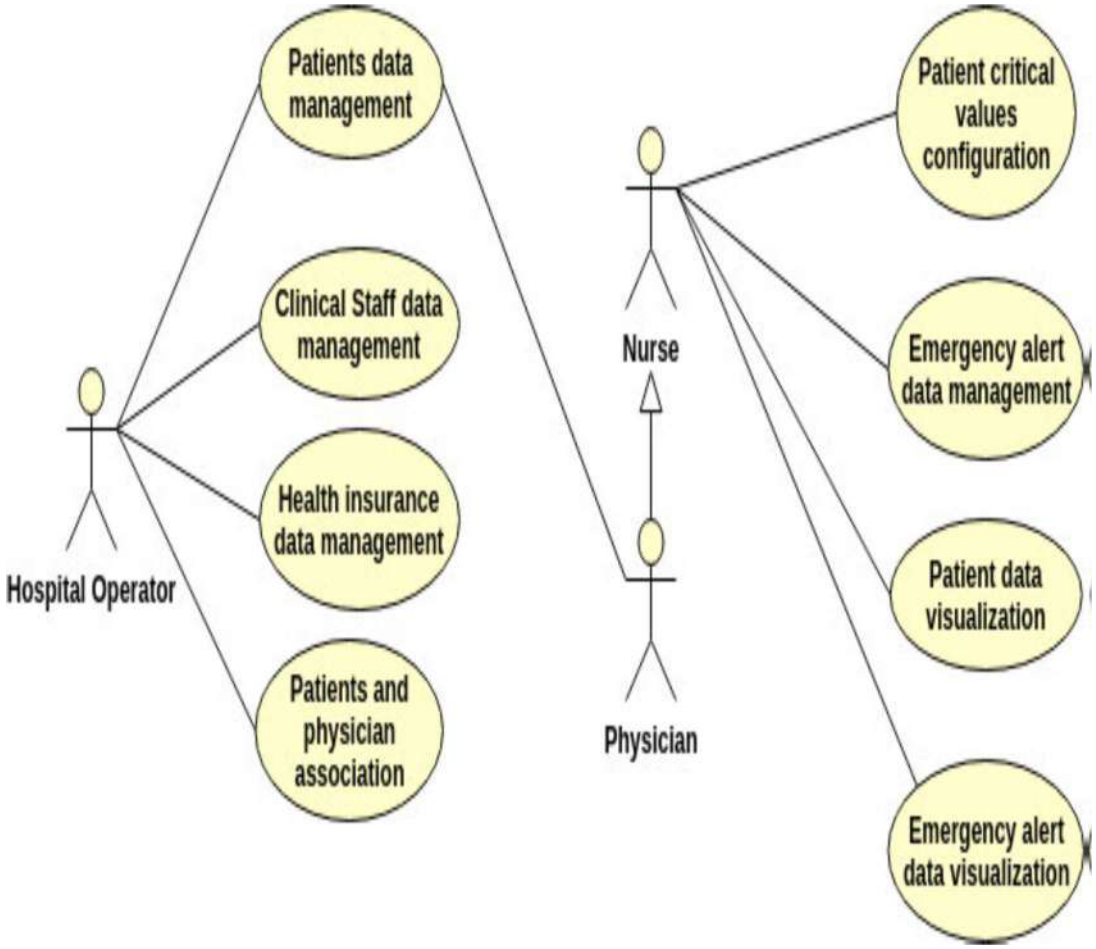

figure 1: healthcare platform uses case diagram

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III. BLOCK DIAGRAM

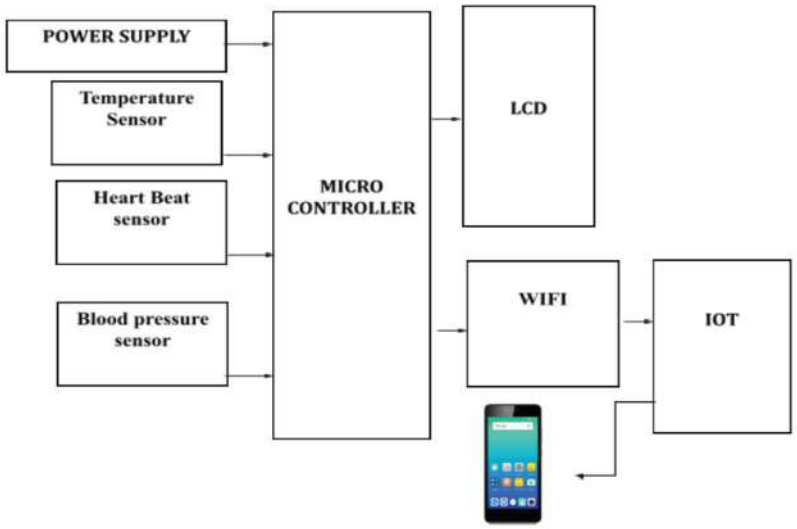

figure 2: block diagram of IOT based healthcare platform

DESCRIPTION OF BLOCK DIAGRAM: Above figure shows the block diagram of the project entitled "An IOT based Healthcare Platform for patients in ICU beds during the Covid-19 Outbreak".

THE REQUIRED EQUIPMENT OF IOT BASED HEALTHCARE PLATFORM:

1. MICRO-CONTROLLER (ARDUINO UNO): A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. Atypical microcontroller includes a processor, memory and input/output peripherals on a single chip.

2. LCD (LIQUID CRYSTAL DISPLAY): LCD is the technology used for display in notebooks and other smaller computers. Like LED and gas plasma technologies, LCD, sallow displays to be much thinner than cathode-ray tube technology.

3. TEMPERATURE SENSOR: A temperature sensor is a device that is designed to measure the degree of hotness or coolness in an object. The working of a temperature, meter depends upon the voltage across the diode.

4. HEARTBEAT SENSOR: The heartbeat sensor is based on the principle of photoplethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ.

5. BLOOD PRESSURE SENSOR: Blood Pressure can be measured both by invasive and non-invasive methods. In the non-invasive method, no piercing is required and Is easy to use. Blood Pressure Sensor is used to measure the blood pressure using the non-invasive method.

6. POWER SUPPLY: Th e power supply section is the section which provide +5V for the components to work. IC LM7805 is used for providing a constant power of +5V.

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IV. FLOW CHART

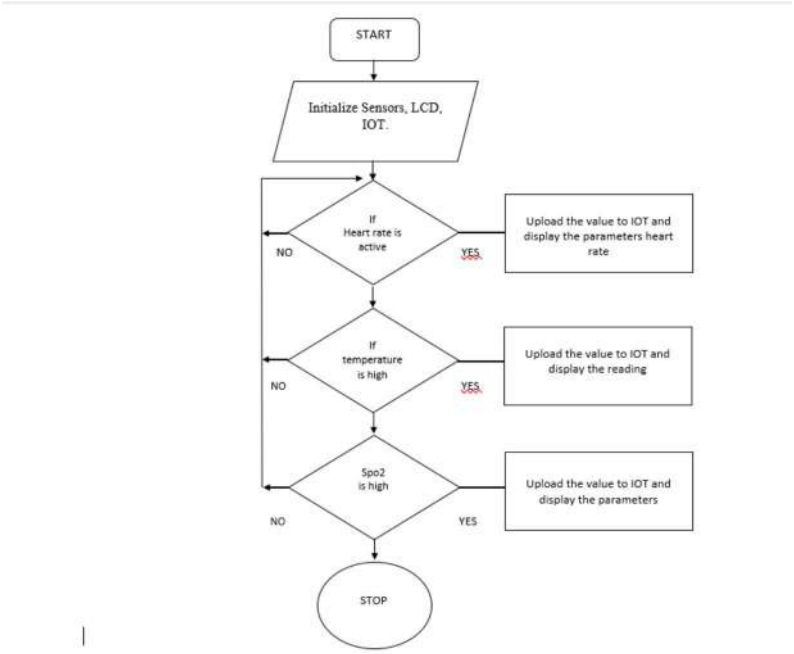

Figure 3:flow chart of working model

sensors that monitor the patients, enabling better working conditions for the clinical team, lower costs for the hospital and better assistance for people who are hospitalized.

V. SCHEMATIC DIAGRAM

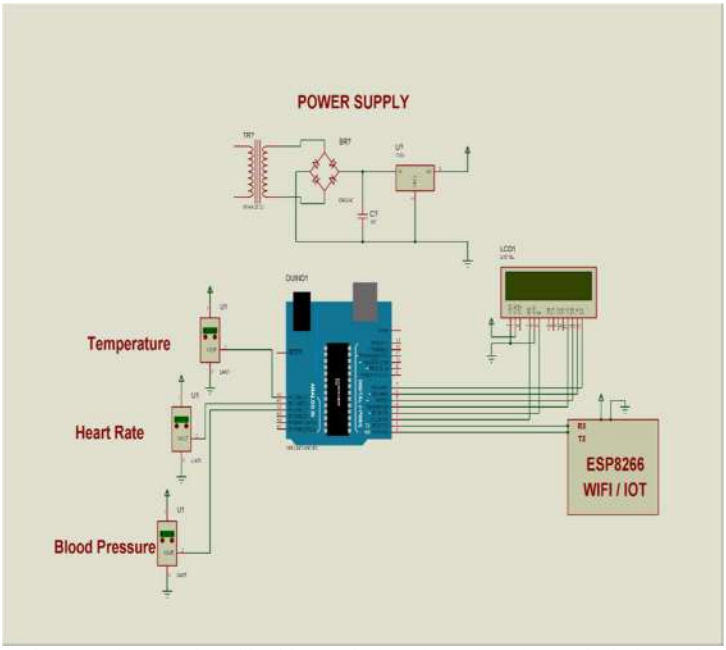

Figure 4: schematic diagram of an IOT-based healthcare platform for patients in ICU beds during the covid-19 outbreak

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VI. WORKING MODEL

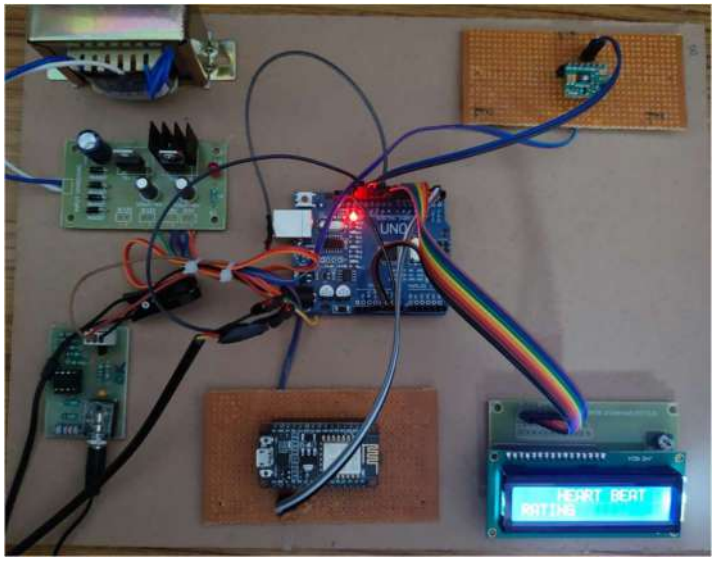

figure 5:working model

VII. CONCLUSION

The project "AN IOT BASED HEALTHCARE PLATFORM FOR PATIENTS IN ICU BEDS DURING COVID-19 OUTBREAK" been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly using highly advanced IC's and with the help of growing technology the project has been successfully implemented.

This experience offers an important foundation for expanding our approach for other contexts involving critical patient monitoring. We hope that these results will attract interest in the expansion of researches on this topic. As a result, we will evolve towards filling in the current gaps and limitations hindering the adoption of continuous health monitoring supported by unobtrusive sensors.

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