Smart Health Care System Using Blynk & IOT

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Abstract- *Smart Health Care (SHC) refers to the monitoring of patients through the help of sensors. It is basically a network of sensors used for medical purposes used in emergency conditions such as cardiac arrest, lung failure and heart related failures. It offers both flexible operations as well as saves cost for both medical professionals as well as patients. In this system the critical patients are provided with a variety of sensors connected to their body which continuously sense each and every changes happening in patient's body and monitoring it through Blynk Application (Android). There is a threshold value set for all the sensors and once the sensor value crosses the threshold, there is a notification message sent to the blynk application to inform nearby doctors, nurses as well as family members.*

Keywords- Smart Health Care (SHC), Medical sensors, Blynk Application.

I. INTRODUCTION

Health is an integral part of one's happy life and India is major hub of health tourism in the world. Its medical tourism sector is estimated to be worth US$3 billion and it is ever rising. Irrespective of this, the death rate in India is quite high because of lack of proper monitoring systems in the local hospitals. Being a powerhouse in the medical tourism around the globe, these figures do not exactly go with the reputation that India has built over the years of in the field of medicine. There are many reasons for this decline over the years, varying from lack of infrastructure in the hospitals to not getting medicines and facilities to the patient. But, the major factor for this is the lack of appropriate medical attention at the right time to the patient, at the time when any stroke or happens to the patient without the knowledge of the doctor. This can happen even when a patient is admitted to a hospital, in any ward. For instance, when any organ failure happens to a patient while he is in hospital, the doctors doesn't come to know about it right there and then but when they do, it sometimes becomes too late to recover the patient from the attack. So, it is very important for a doctor to get a live feed information about his patient's health to treat the patient effectively. For this, it is essential to have a Smart health care system installed for all its patient around the hospital for the proper monitoring for their health and wellbeing. A Smart health Care System is a technological advancement of an emergency medical and monitoring system for a Patient, that would get the live data stream of the patient to its doctor continuously and if any organ failure were to happen, then it would notify the nearby doctors and nurses along with the nearest kin of the situation and that would save them few precious seconds that could be the change between one's life and death. Time is such a crucial constraint in that period for both the doctor and patient that it could be the difference between successful operations and the unsuccessful ones. Smart Health Care system can also be used to by users to improve health related risks and reduce health care cost by collecting, recording, sharing and analyzing large streams of data in real time efficiently. It can be used in the Intensive Care unit (ICUs) of the hospital effectively and efficiently. By this the doctors need not necessarily have to monitor a single patient at one time, they can monitor and analyze the data of multiple patients at a time there by treating many patients at once that saves them the precious time to see more patients and hence working efficiently.

II. LITERATURE SURVEY/RELATED WORK

On comparing our proposal with other related papers such as in [1],[2],[3] and [4]. The paper in [1] mainly focuses on seamless gather and sharing the information with each other and also stores the information, making it possible to collect record and analyze data. Therefore, patients will have high quality service [1]. Here, the data can be stored for analysis and later reference, but our paper mainly focuses on emergency situation and only when the threshold values of normal conditions are violated, the notifications are sent to the concerned people and the family doctor.

Whereas the paper [2] provides an intelligent smart health system using some sensors and microcontrollers; it will sense the body condition and send the data to the collaborated hospital's website. If the condition is critical, an ambulance is allotted to that particular location where the patient lives [2] and it is directed using google maps.

Paper [3] is based on the monitoring of the patient that is done by the doctor continuously without actually visiting the patient. As a result, visits of doctors to the patients

constantly are decreased as the information regarding patient's health directly reaches to doctor's monitor screen from anywhere the patient resides. It uses IOT along with Raspberry Pi, which acts not just as a sensor node but also a controller here.

Paper [4] presents another patient monitoring system that uses sensors as well as a fit bit which are connected to a raspberry pi board. It involves alerting the doctor through SMS if any vital parameter of the patient deviates from the normal value and also ensures that the patient takes the prescribed medication at the right times. The raspberry pi acts as a personal server which logs the details of the patient's medication [4].

Therefore after all the research work done, our paper promotes the use of another technology known as the blynk application that helps the relatives to receive alerts about the patient's health conditions.

Our proposed paper mainly focuses on emergency situation and only when the threshold values of normal conditions are violated, the notifications are sent to the concerned people and the family doctor. Also the use of **Blynk** application helps the patient's close as it can easily downloaded by the family members in order to monitor the patient's health status.

III. PROPOSED TECHNOLOGICAL APPROACH

Our proposed system is to design a device in which the heart beat sensor will sense the heart beat, Tilt sensor will sense the body movement or jerk, Glucose sensor will sense the sugar levels in the body and temperature sensor will sense the body temperature. After sensing, sensors will send respective data to Arduino board. After that arduino board will send it to Blynk Application. There are basically two main technologies used to setup the defined structure and those are IOT (Internet of Things) and Blynk.

IOT : The Internet of things (IoT) is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators,and connectivity which enables these things to connect, collect and exchange data. IoT involves extending Internet connectivity beyond standard devices, such as desktops, laptops, smart phones and tablets, to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. Embedded with technology, these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled. With the arrival of driverless vehicles, a branch of IoT, i.e. the Internet of Vehicles starts to gain more attention [8].

Blynk: Blynk is a platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. We can easily build graphic interfaces for all your projects by simply dragging and dropping widgets.

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things. It allows to you create amazing interfaces for your projects using various widgets we provide.

Blynk Server-responsible for all the communications between the smart phone and hardware. We can use our Blynk Cloud or run your private Blynk server locally. Its open-source could easily handle thousands of devices and can even be launched on a Raspberry Pi. For all the popular hardware platforms - enable communication with the server and process all the incoming and outgoing commands. Blynk works over the Internet**.** This means that the hardware you choose should be able to connect to the internet [5].

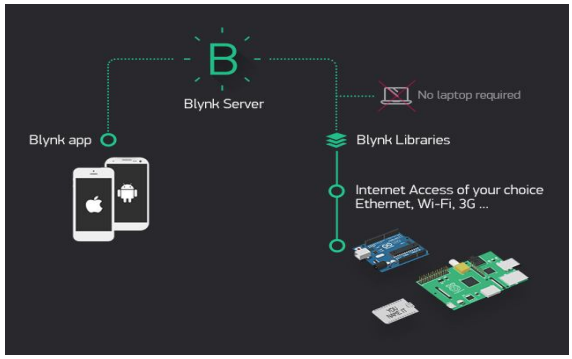

Figure 3: Working of Blynk [5]

IV. BASIC STRUCTURE OF SHC

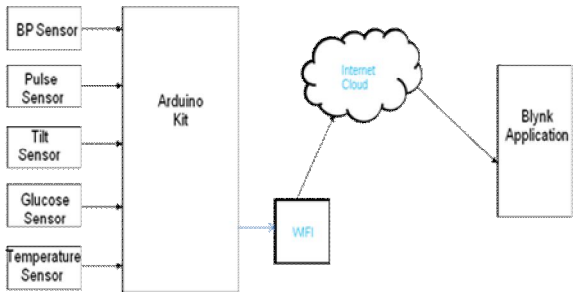

Figure 1: Structure of SHC

The basic structure of Smart Health care (SHC) system is comprised of 5 different medical sensors namely BP sensor, Temperature sensor, Tilt sensor, Pulse sensor, Glucose

sensor. Here all the sensors are directly connected to Arduino kit. The sensors continuously keep checking the respective values and send all the data received to the arduino board. The arduino board is connected to a blynk application i.e an android app. The change in any of the values reported by the sensor is accessed by the aurduino kit and then on every new value crossing the threshold there is a notification sent to the blynk application informing about patient's current health conditions to nearby doctors and nurses available in the hospital.

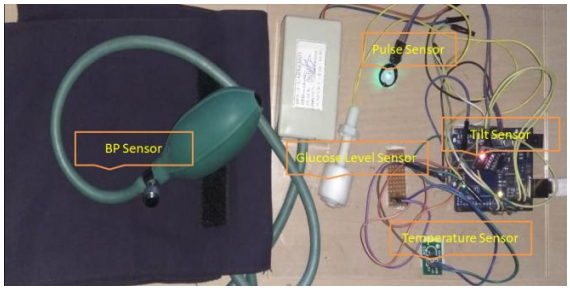

Figure 2: Arduino board with 5 Medical sensors [7].

V. COMPONENTS USED IN SHC

For implementing and executing the Smart Health Care(SHC) system for patients there are various components used to manipulate serious health problems such as BP Sensor, Temperature Sensor, Tilt Sensor, Pulse Sensor , Glucose Sensor, Arduino Kit, and Blynk Application.

BP Sensor: The blood pressure sensor is generally used to measure human blood pressure. It also measures the systolic and diastolic pressure and pulse rate is also recorded by this sensor. It is more accurate and reliable than the sphygmomanometer, the instrument attached to inflatable air bladder cuff and used with a stethoscope for measuring blood pressure in an artery. In simple word, pressure of blood against blood vessels walls or arteries is measure using blood pressure sensors [3].

Temperature Sensor: The Temperature Sensor is an IC sensor that is used to measure temperature with an output voltage linearly proportional to the Centigrade temperature. It has an advantage over linear temperature sensor, as the user has not to make the conversion of Kelvin to Centigrade. The major significance of is this type of sensor is that it directly converts in Celsius and it is also suitable for remote applications. It has better efficiency than thermistor [3].

Tilt Sensor: The Tilt Sensor basically used for measuring the tilt in multiple axes of a reference plane. Tilt sensors generally measure the tilting position with reference to gravity and are used in a variety of applications. They enable the easy detection of orientation or inclination. Similar to mercury switches, they may also be known as tilt switches or rolling ball sensors. The key specifications of tilt sensors are number of axes, Resolution, Sensitivity, Measuring range, Noise tolerance and vibration [6].

Pulse Sensor: The Pulse sensor or the Heartbeat sensor is used to measure the heartbeat of the patient. It gives a digital output of heart beat when a finger is placed on it. It is compressed in size. The working voltage of heart beat sensor is +5V DC. It works on the principle of light modulation by blood flow through finger at each pulse. Heart beat sensor is used to measure heart beat which normally lies between 60-100bpm.

Glucose Sensor : A glucose sensor is the part of a continuous glucose monitoring system that is inserted under the skin and measures your glucose (sugar) levels. It sends your glucose data wirelessly to the system receiver or a compatible smart device, so we can track our blood sugar highs and lows at regular intervals, and make informed treatment decisions.

Arduino Kit : Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Arduino boards are relatively inexpensive compared to other microcontroller platforms. it runs on Windows, Macintosh OSX, and Linux operating systems [6].

Blynk Application: Blynk is a Platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where we can build a graphic interface for our project by simply dragging and dropping widgets. It's really simple to set everything up and we'll start tinkering in less than 5 minutes. Blynk is not tied to some specific board or shield. Instead, it's supporting hardware of our choice. Whether your Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or this new ESP8266 chip, Blynk will get you online and ready for the Internet Of our Things**.** Blynk projects can be linked to the CHIP, in order to receive real-time data on our Blynk app. This is simply the data that would be displayed on a connected OLED display and is refreshed the same way and not saved on your device. The data is still uploaded to the dashboard. This is a convenient method of checking the status of your sensors as well as being more mobile than a laptop or desktop viewing the data on the dashboard [5].

VI. IMPLEMENTATION

While implementing our project finally after all the development and testing processes are done, we have implemented our system with five different sensors namely : tilt sensor, sphygmomanometer, LM35,float switch and pulse sensor for overall measurement of health parameters of human body. We have used an arduino board to connect all these sensors to the chip present on the board. We have used arduino IDE and blynk application for implementing our code encoded in embedded C to collect data from the sensors and send it to blynk android application. During the process of implementation of the system we tried the connection of arduino board to blynk application using WIFI mode, USB mode as well as Bluetooth mode and worked successfully , but the most efficient and reliable was WIFI mode, which provides a wide range coverage and faster transmission of sensed data to the android application.

VII. RESULT ANALYSIS

TABLE 1 : HEALTH PARAMETERS MEASUREMENT TABLE

Modules	Data Range	Information Size	Periodicity	Expected Output	Actual Output
Pulse Sensor	0 –150 BPM	0 – 20 Kb	1 sec	Notification in the app if pulse rate crosses 110 BPM	As Expected
Blood Pressure Sensor (Sphygmomanometer)	10 – 400 mm Hg	0 – 20 Kb	1 sec	Notification in the app if Blood pressure value crosses 140/90	As Expected
Temperature Sensor (LM35)	24 °C – 44 °C	0 – 20 Kb	1 sec	Notification in the app if the temperature value crosses 37 °C	As Expected
Tilt Sensor (ADXL335)	360° in all directions	0 – 20 Kb	1 sec	Notification in the app if the tilt angle crosses 180°	As Expected
Glucose Level Sensor (Float Switch)	0 – 1500 ml	0 – 20 Kb	30 mins	Notification in the app if the glucose level in bottle crosses 100 ml	As Expected

In the result analysis, we found that this system can be used to transmit the patient vital parameter information in real-time to remote location and can be seen by the care taker. The sensors are connected to the Arduino board. The sensed values are transmitted wirelessly to the Arduino which is connected to the Blynk Application. It can be easily installed in hospitals, houses and can serve as a large database to collect data and this could serve as a prediction modeling system ; for example if a patient's health parameters are changing in the same pattern as a previous patient in the database , the nature of the disease/ health problem can be easily identified and can help in finding the remedy faster as it calculates all the different health parameters of human body every second and notifies the doctors and relatives immediately whenever the sensed values cross the threshold. The proposed system is simple, power efficient and easy to understand. It acts as a connection between patient and doctor. The hardware for the project is implemented and the output results are verified successfully.

VIII. CONCLUSION

The paper presents the design and implementation of an IOT-based health monitoring system for emergency medical services which can demonstrate collection, integration, and interoperation of IoT data flexibly which can provide support to emergency medical services like Intensive Care Units(ICU), using a **Blynk** application which normal people can easily install in their phones and get access.

The proposed outcome of the project is to give proper and efficient medical services to patients by connecting and collecting data information through health status monitors which would include patient's heart rate, blood pressure and Temperature and sends an emergency alert to patient's doctor with his current status and full medical information.

The idea of this project came so to reduce the headache of patient to visit to doctor every time he need to check his blood pressure, heart beat rate, temperature etc. With the help of this proposal the time of both patients and doctors are saved and doctors can also help in emergency scenario as much as possible.

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