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Patient Health Monitoring System Using Iot Technology

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Abstract: In today's health-care environment, science and knowledge are founded on wireless-sensing node technology, and this has allowed for significant development. Patients are put in the precarious position of having an unexpected death as a consequence of the specific cause of heart difficulties and heart attacks, which is the absence of good medical maintenance being provided to patients at the appropriate moment. This is for the purpose of specifically monitoring elderly individuals, as well as notifying medical professionals and loved ones. As a result, we are recommending the implementation of a new initiative known as Patient Health Monitoring. This method employs sensor technology and makes use of the internet to communicate with the patient's loved ones in the event that there is a problem. This method monitors a patient's overall health by monitoring their heartbeat. The sensor has been linked up to the NodeMCU (ESP8266**)**. In order to keep track of the patient's health, the microcontroller is interfaced to a wi-fi connection, which then sends the data to the web server that acts as the wireless sensing node. Over the network, this system also displays patients' heartbeat data in real time, complete with timestamps. Therefore, a patient health monitoring system that is based on IoT makes use of the internet to efficiently monitor patient health. This not only assists the user in watching their loved ones while they are at work, but it also helps save lives.

Index Terms **– Patient, IoT, Pulse sensor , heartbeat, ThingSpeak.**

I. INTRODUCTION

In today's environment, it is quite challenging to transport patients from their homes to hospitals for routine checkups. There are a lot of obstacles, such as having to wait in queue, the length of time it takes to travel, and the possibility that a patient will get sick from moving around in such a dirty atmosphere. Therefore, the health care business is shifting its focus to services that can be provided in the patient's home, such as medical checkups that can be performed in the patient's familiar surroundings. The health care industry and the information and communication technology business are collaborating to build models that can reduce the amount of time that is used, increase accuracy, and be interoperable on any platform. These models will be useful to hospitals as well as patients. Experts estimate that over 50 billion gadgets will be connected to the internet by the year 2020. The Internet of Things (IoT) is currently achieving development at a rapid speed. It is a type of technology in which all things, such as automobiles, buildings, sensors, and the like, are connected to the internet by utilising the infrastructure that is already in place.

Biotelemetry refers to the use of electrical methods to transmit biological data from a living organism and the environment in which it resides to a point where the data can be analysed or recorded. The patient will have a wireless health monitoring gadget linked to them, and doctors will be able to monitor the patient from anywhere in the globe using their computer. In most cases, the system for monitoring a patient's health consists of a variety of sensors that are responsible for gathering the physiological data from the patient and transmitting it to the microcontroller in the form of electrical impulses. The physiological data are processed by the microcontroller, and then they are transmitted to an accompanying website that is linked to the Internet of Things module. By entering the one-of-a-kind that was provided to the patient into the website's login field, the attending physician or another caretaker can access the page. Since we are storing the data in the cloud, it is available whenever and wherever it is needed to be accessed over the internet. The patient does not need to bring all of their medical reports with them to the check-up. Simply by entering the patient's identification number into that website, the physician has instant access to all of the patient's medical records. The primary purpose of this project is to create a Patient Health Monitoring System that is capable of sensing the patient's pulse and periodically uploading that information to the ThingSpeak cloud in order to facilitate timely observation.

II. LITERATURE SURVEY

As project reports or research papers on IoT-based patient health monitoring systems, a number of evaluations on the topic of wireless sensors and their methodologies have been completed in the past. The first system that the researchers developed was a patient health monitoring system that used an Atmega-8 microcontroller in conjunction with a Wireless Body part Sensing-Network (WBPSN).The "Pulse sensor" (also known as a "Heart beat sensor") is what's being used in this work as the sensor.

a.) The patient wears this sensor, which monitors their health without interfering with their normal routine and The GSM modem, the microcontroller, the LCD display, and the sensors that make up the health monitoring system are used to send or receive information regarding the patient's health to or from the physician. As a result, the same GSM modem is utilised at the doctor's facility. It just takes a little amount of time to inform the patients and their loved ones about the results, and the report is delivered promptly and without any interruptions.

b) The second one makes use of a strategy that is very similar to monitor the parameters. The parameters that are being monitored are transmitted by using RF-ID for each user, Bluetooth version 2, GSM, and UMts. The circulatory strain of the patient can be screened using this framework in the office. The health-related parameter communicates in a direct manner with the specialist by utilising GSM and UMts. Video direct is used in this instance. This video management highlight is appropriate for the patient's age as well as his circulatory strain. The information regarding BPM is received by the customer touch-pad through RF-ID and Bluetoothv2.

c.) The information from the customer touch-pad is sent to the wellness parameter. Additionally, using GSM and UMts remote technology, these health metrics are particularly sent to a distant server farm, and then the remote server farm is sent to the specialist. When information is conveyed, it is done so in bundles. This structure is responsible for storing historical data.

d) The third one functions in a manner that is analogous to that of the first system; however, rather than a PIC microcontroller, an Atmega-328 microcontroller is used, and a wifi module is used to send the data to both the attending physician and the patient's loved ones. This makes use of the CipMux Fetch and upload mechanism that is built into the WiFi module 8662i. The Wi-Fi module retrieves the parameters and uploads them to the php server, where they may be conveniently checked by the attending physician. The values of the BPM, temperature, and electrocardiogram are displayed in a table along with the respective timestamps.

III. BLOCK DIAGRAM OF THE PROPOSED SYSTEM

Figure 1 represents the block diagram of the project and design aspect of independent modules. A connection needs to be made between the signal pin of the pulse sensor and an analogue pin on the ESP8266. Additionally, there is an LED that is attached to the digital pin of the ESP32 that blinks in response to the pulses that are generated by the sensor. The LED flashes in response to the pulses that are being collected by the sensor from the human body, which measures heart rate data. After that, the ESP8266 uploads the data to the cloud service provided by ThingSpeak. It is necessary for the board to be linked to a Wi-Fi network in order to achieve this goal.

The ThingSpeak platform allows to a great deal of leeway in terms of data management and storage. In addition to this, it possesses intelligent tools and widgets for visualising and analysing data through the use of

graphs. Real-time data can be monitored with it, and the results can be viewed on a remote display, mobile phone, or laptop computer. This functionality is available.

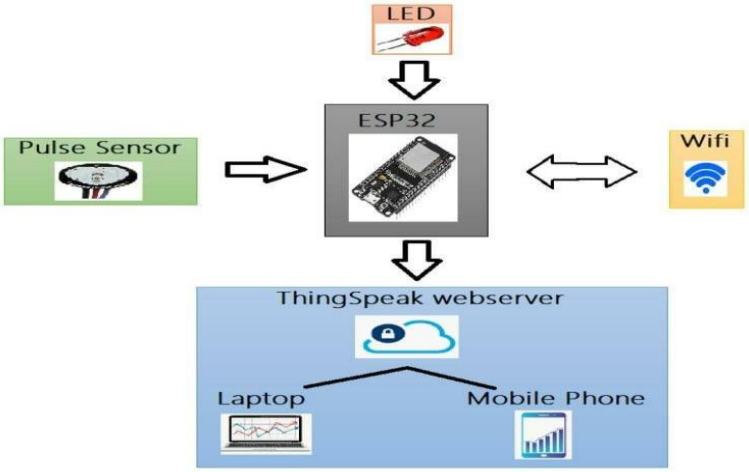

Figure 1: Block diagram of the project

IV. COMPONENTS DESCRIPTION

HARDWARE DESCRIPTION

I) Pulse Sensor

The Pulse Sensor is a heart-rate sensor that can be used with Arduino and simply requires plugging it in. Students, artists, sportsmen, makers, and developers of games and mobile apps that wish to effortlessly incorporate live heart-rate data into their projects can utilise it. The essential component is a noise-free optical amplifier and sensor that is incorporated into a single circuit. Once the Pulse Sensor attached to either to earlobe or fingertip and plugged into Arduino, heart rate will be able to read your. Additionally, it comes with an Arduino demo code that simplifies the process of using it. The pulse sensor has three pins, which are as follows: V_{CC}, GND & Analog Pin. The figure2 depicts the pulse sensor. This sensor module's centre also contains an LED, which plays a role in the process of determining whether or not a heartbeat is present. There is a noise reduction circuitry located underneath the LED. Its purpose is to prevent the readings from being impacted by the background noise.

Figure 2: Pulse sensor

II) ESP8266

The ESP8266 is a gadget that may provide internet connectivity to projects at a low cost and with a very short learning curve. Due to the fact that the module is capable of functioning both as an Access point (it can establish hotspots) and as a station (it can connect to Wi-Fi), it is able to simply get data and upload it to the internet, thereby making the Internet of Things as simple and straightforward as is humanly feasible. It can also retrieve data from the internet via application programming interfaces (APIs), which means that your project could access any information that is available on the internet, making it smarter. The fact that this module can be programmed using the Arduino IDE, which makes it a lot more user-friendly, is yet another fascinating feature that it possesses. The ESP8266 module can only function at 3.3V; any voltage higher than 3.7V will cause it to fail, thus exercise extreme caution when designing circuits. The figure 3 represents ESP8266 microcontroller and it's pins.

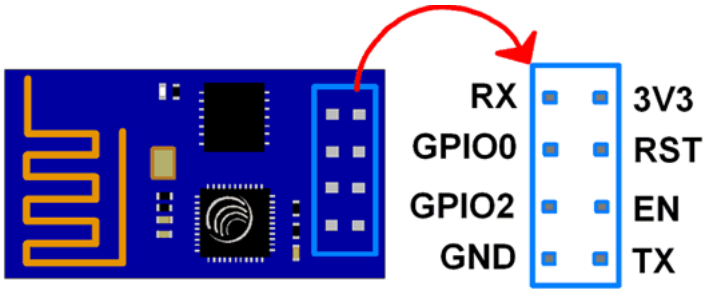

Figure 3 : ESP8266 microcontroller

SOFTWARE DESCRIPTION

I) Arduino IDE:

The Arduino Integrated Development Environment (IDE) is a cross-platform application that can run on Windows, macOS, and Linux. It was developed using C and C++ functions. It is used to write programmes and upload them to boards that are compatible with Arduino. Additionally, with the help of third-party cores, it may be used with other vendor development boards.Arduino IDE is used to coordinate and configure the functionalities supplied by the various hardware devices and Arduino UNO. The figure 4 represents the Ardunio IDE environment window.

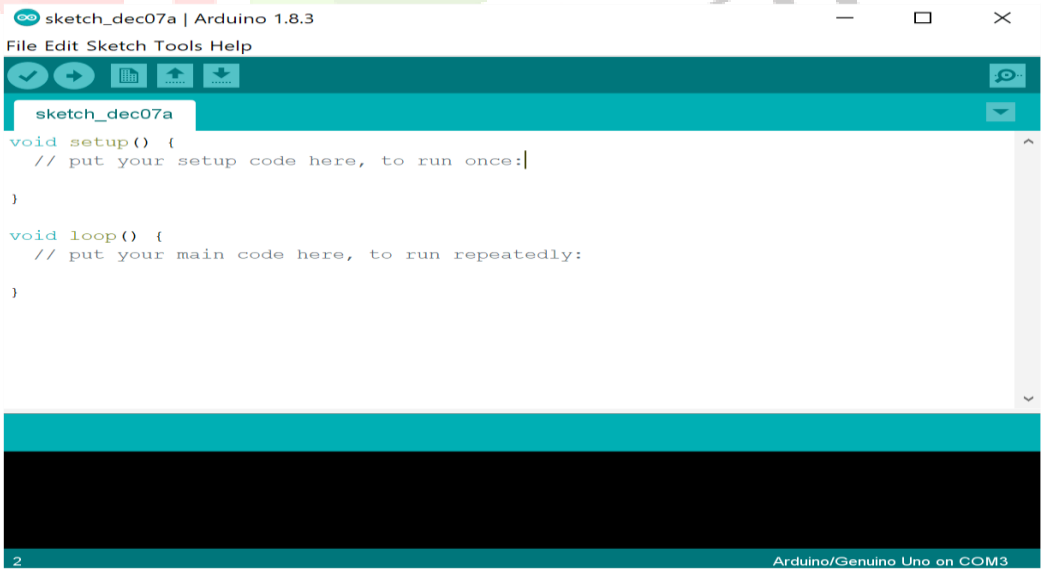

Figure 4: Arduino IDE environment Window

II) ThingSpeak Cloud

ThingSpeak allows to aggregate, visualize and analyze live data streams in the cloud. IoT analytics platform service ThingSpeak gives users the ability to aggregate, visualise, and do cloud-based analysis on live data streams. The data that is uploaded to ThingSpeak from your various devices is immediately visualised by the platform. Because MATLAB® code can be executed in ThingSpeak, it is now possible to undertake online analysis and processing of the data as it is being collected. ThingSpeak is frequently used for prototyping and proof of concept exercises for Internet of Things systems that involve analytics.The aggregation, visualisation, and analysis of live data streams in the cloud are all possible with ThingSpeak.The figure 5 depicts the ThingSpeak platform.

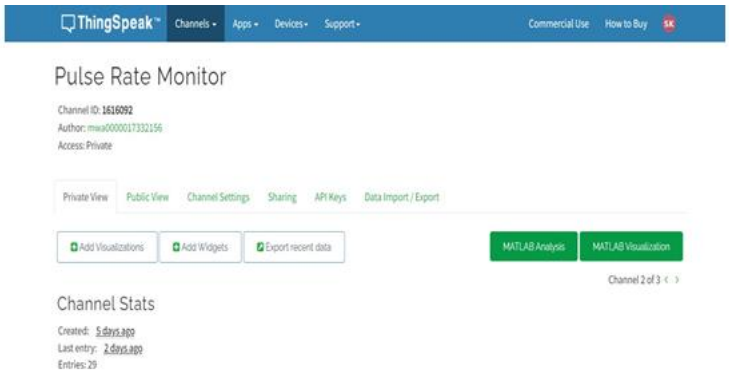

Figure 5: Thingspeak platform

V. HARDWARE IMPLEMENTATION

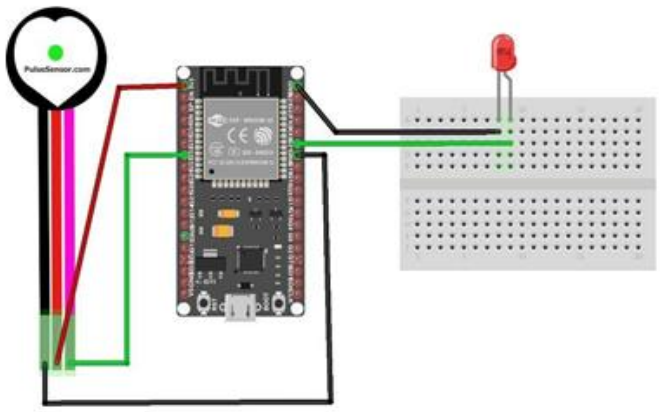

Figure 6: Hardware implementation of the proposed work

VI. RESULT AND CONCLUSION

When we need to monitor and record and keep track of changes in the health parameters of the patient over the course of some amount of time, IoT Monitoring is a pretty helpful tool that proves to be really useful. Hence, with the help of IoT health monitoring, we will be able to compile a database of the many shifts that have taken place in the health indicators. When making recommendations on a patient's therapy or medication, a physician may consider the patient's history as well as any recent changes in the patient's condition. Hospital stays are cut down significantly thanks to remote patient monitoring. The data pertaining to the patient's health parameters are kept in the cloud. Therefore, the use of this method offers more advantages than the traditional method of storing the records on printed papers that are stored in the files. Or even the digital records that are stored on a particular desktop or laptop computer, or even a memory device such as a pen drive. Because there is always a possibility that the data stored on these devices will become corrupted or deleted. On the other hand, when it comes to the Internet of Things, data storage in the cloud is

more dependable and only has a small probability of being lost. The figures 7 and 8 depicts the outputs in Ardunio Console Window and its pulse rate monitoring in ThingSpeak platform.

As a result, the Patient Health Monitoring System that we built using IoT Technology has been a success. We are able to acquire the patient's pulse rate for the purpose of this project, and we can also upload the periodic pulse rate values that we measure into the ThingSpeak platform, which will be useful for future applications.

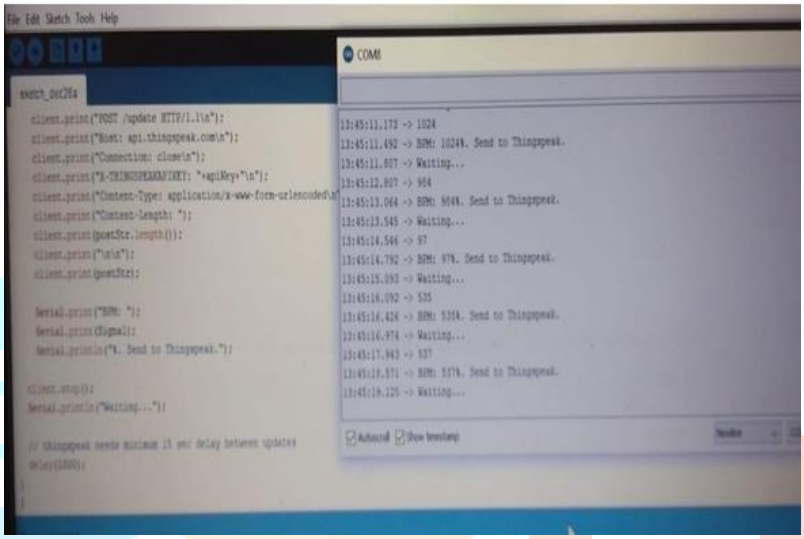

Figure 7: Output in Ardunio Console Window

Figure 8 : Pulse rate monitoring in ThingSpeak platform

VII. FUTURE SCOPE

With the help of this idea, our work in the future will consist of being able to control and move things remotely around physically abled people. When there is an increase in the patient's heart rate, we can connect this module to the emergency alert system that sends a signal to the closest hospital ambulance. This can later be updated to additional modules, such as sophisticated forms of integrated boards, microcontrollers, and VLSI chips.

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