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IoT Based Remote Health Monitoring System with Electrocardiograph

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Abstract: *In recent years, especially in the context of covid health care development, we have seen that a less amount of medical facility gotten to a patient. To track a few individual data athome like temperature, pulse rate and heart beats of the patients and inform the doctors in case of any patient emergency. To track this data doctor needs a platform to see that data like temperature of patient's body, what's the heart rate of patient for this we are using Thing speak server using this doctor can see the condition of patient. This platform where users can display records in real-time basis. In this paper we discussed health monitoring frameworks that allows patients to be supervised without the need to consult a physician who can be using with market sensors. This module provides the necessary opportunity for a day-to-day paramedic company that canbe recorded by a doctor and can receive a notice anyway in an emergency. This field position is most commonly used while the patient is under normal examination or under long-term home care. To measure heart rate usually use a heartbeat sensor but this system will use an AD8232 sensor that will display a patient's Electrocardiograph using the IoT system. Our project proposes a flexible health monitoring system with Electrocardiograph modifications.*

Keywords: Arduino, Electrocardiogram, Pulse Rate, Blood Pressure, Temperature, Stress, IOT Monitoring System.

I. INTRODUCTION

The growing network of IoT connected devices is growing every day. Most of these technologies are used to improve the efficiencyof health care. In this paper we present the various situations in which the health care system finds it useful for physicians and patients. The health care system is most effective during road accidents, when the affected person can be monitored up to the hospital. patients who haveto monitor for a long time which causes the nurse to call and may use a Health Monitoring System. This study helps patients who live in remote areas who do not have access to health facilities.

greater intently in India, each day many of the peoples are concerned by coronary heart diseases, and mostly because of the patients did no longer get timely and right assist. The present-day document of The India Spend analysis of information says that the 50-60 thousand doctors' scarcity in India.

Medical care is given more significance nowadays in almost every country considering the effect of Covid. With respect to that the most appropriate approach toward health monitoring is an IoT- based health monitoring system. Internet of Things is a new and advanced approach that is growing at a rapid rate in clinical consideration. By using the wearable sensors and the reports available at our fingertips by mobile phones, the popularity of IoT is based health monitoring is increasing at a much higher speed.

IoT-based health monitoring helps in reducing the spread of illness and provides better guidance about our health even if the expert or doctor is sitting at a far distance. Here in this paper, we have proposed a flexible health monitoring system that can continuously screen the patient's temperature, pulse, and various limits. This dataof the user can be stored and checked on a web server platform named "Thingspeak". This monitoring system using IoT helps to store data and sent continuous information about users' health to doctors, relatives, and friends from a distance, which helps to track regular health and avoid future uncertainty.

One additional part of our model is the real-time monitoring of ECG. This helps to continuously monitor the patient's heart rhythm.

II. METHODOLOGY

The temperature, blood pressure, heartbeat, and values are sensed by the sensor and the sensor values are sent to the microcontroller for further processing and storing. Whenever the microcontroller encounters the abnormal value of any parameter, it alerts the person by sending an SMS to the mobile using the Wi-Fi module, Also, these values are sent to the thing speak server.

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2.1 Remote Health monitoring system using Electrocardiograph

Healthcare applications are more significant among the application inIoT that is being worked on within the world. IoT has been extensively used to interconnect the significant level clinical resources and to offer quick and convincing clinical consideration organizations to people. The undeniable level sensors can be either worn or embedded into the body of the patients, to screen their prosperity persistently. The information accumulated in such a manner can be dissected, added up to, and mined to do the early forecast of sicknesses.

Every possible research is going on in the field of the Internet of medical things, in this we are developing a health monitoring system with ESP8266, LM35, Think speak, and Arduino Uno which will beintegrated with the Electric wheelchair for the continuous health monitoring of the patient on E-Wheelchair, which makes this project intelligent.

In this model, we are using Arduino UNO to integrate all the sensorslike LM35, pulse sensor, ECG sensor, Stress sensor, etc. For monitoring the patient's health condition. Like temperature, heart rhythm, pulse rate, etc. The Remote health monitoring framework block diagram is displayed in fig. Below.

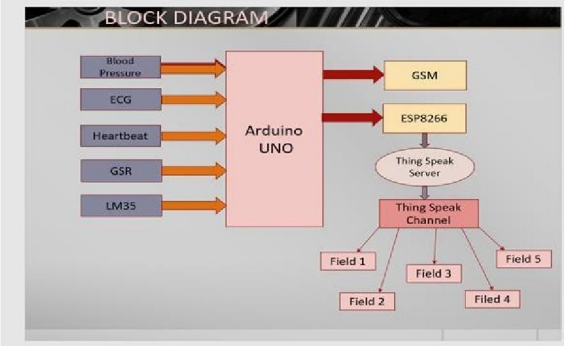


Fig.: Remote Health monitoring system using Electrocardiograph

The LM35 temperature sensor is utilized to measure the body temperature of the patient. The patient's body temperature information from this sensor is sent to Arduino UNO Microcontroller. The GSM SIM900A module is utilized to send ready messages to the predefined cell phone. The LCD is likewise associated with Arduino for showing data received from the various sensors.

2.2 Components Required for Hardware

The Components required for hardware design are given as follows:

A. Arduino Uno

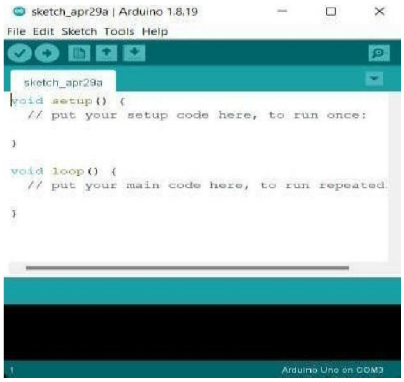
Fig. Arduino

Arduino is in a generally an open-source stage used for building electronic adventures (Fig.). UNO is the most well-known board used. It works on 5v inventory at 16 MHz clock speed and the processor is ATMega 32. Arduino IDE is an item used to type the code and move it onto the heap up.

B. Arduino IDE

Arduino board can be controlled in two distinct ways. One, using the USB connection from the PC, and two, from the AC mains using the power barrel jack. The board has a voltage regulator for giving offset DC voltages tall parts. It has a valuable stone oscillator to give the 16MHz clock repeat, a reset catch to reset the structure, a 3.3V, a 5V yield supply pins, and a ground pin.

Arduino UNO has six basic pins for exchanging data from straightforward sensors also, to change over it to modernized structure for transparency of the microcontroller. It has 14 computerized I/O sticks of which 6 are PWM age pins furthermore, and 1 is a UART pin. Arduino UNO board also includes the Tx and Rx LEDs and power LEDs. It gives a norm structure factor that breaks the components of the more limited size regulator into a progressively accessible pack.



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C. 16 x2 LCD (Liquid Crystal Display)

Fig. LCD display

A liquid crystal display (Fig. 12) is a type of flat panel display used as screens in screens, phones, projects, and so on. It is a combination of two states of issue, solid and liquid. LCD uses liquid pearl to show an undeniable picture. An LCD contains setting enlightenment which gives light to the pixels. It has red, blue, and green subpixels which can be turned on or off using pixels. The display appears dark when all of the pixels and subpixels get off and it appears to be white when all the sub-pixels are turned on

D. Temperature Sensor

The temperature sensor (LM35) is an analog signal. The temperature sensor is used to measure the body temperature of the patient's body. The LM35 works with variations in temperature. The internal structure of LM35 consists of transistors, amplifiers and few resistors. It has 3pins. The output of LM35 is in volts. Every 10 mv change is equal to 1 degree Celsius. Equation to convert voltage into degree Celsius is [(Supply Voltage * 1000/1024)/10] =0.4882.

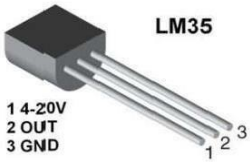

Fig. Temperature Sensor

E. Pulse Sensor

The pulse sensor is also called the heartbeat sensor. The beat LED flashes synchronously with every heartbeat whenit is working. To measure the BPM rate the digital output pin is connected to the microcontroller to get the desired results. It follows the working principle of light modulationby considering the flow of blood through the finger at every pulse.

Fig. Pulse Sensor

F. Wi-Fi Module ESP8266

The ESP8266 is not too costly and very easy to understand to provide access to the Internet. This module works both as a station and as an Access point. It should be operated within the given voltage limit which is3.3V, and any voltage above 3.7V would damage or burn this module.

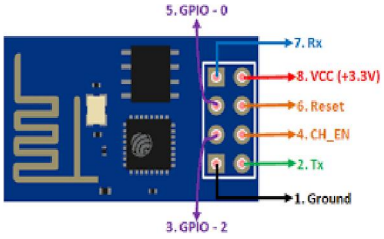

Fig. Wi-Fi Module ESP8266

G. Blood Pressure Sensor

Blood pressure sensor measures and displays the values of the Blood Pressure & Pulse rate, and it will send the measured values to other devices through serial communication. The display shows the readings of Systolic, Diastolic, and Pulse rates respectively. It resembles a wristwatch that eliminates the pumping procedure.

Fig. Blood Pressure Sensor

Specifications of the Blood Pressure Sensor. It operates at 5v, 200ma voltage regulated and each reading consists of IS bytes at 9000 baud rates. The output reading is an S-bit value in ASCH format with fixed digits fi-om 000 to 255.

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H. GSM (Global System for Mobile Communication)

Digital mobile technology such as GSM (Global Telecommunications System) is used to transfer mobile data and voice services. The GSM module is a chip or vice versa, a circuit used to build a system between a mobile phone or a registration machine and a GPRS or GSM system. Currently, GSM technology supports more than one billion mobile subscribers worldwide in the above 210 countries. This technology provides voice and data services from the most important to the most complex. This is a general overview of GSM technology.

Fig. GSM (Global System for Mobile Communication)

I. AD8232 ECG Sensor

Heart disease has become a major problem in the last few years and many people are dying from these complications. So, we are launching this project. The AD8232 sensor operates at an input voltage of 3.3 to 5 volts. The output voltage of the AD8232 sensor is 0 to 3.3 volt. Electrocardiography is a technology that measures the electrical activity produced by the heart. Electrical changes can range from hundreds of micro volts to one millivolt. These changes can be applied to electrodes attached to the skin. re-recording the voltage conversion in a short time gives us a structural voltage. Over time this plot is often called an electrocardiogram to help diagnose various heart conditions

Fig. AD8232 ECG Sensor

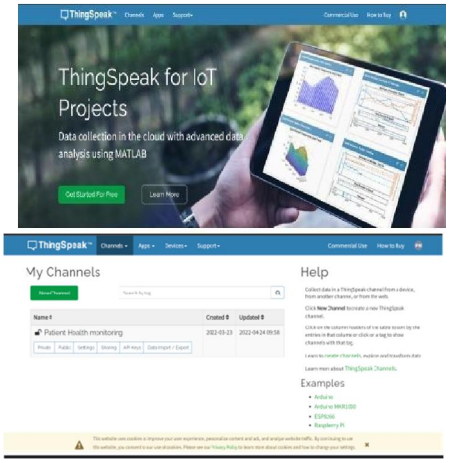
J. GSR Sensor

GSR Sensor stands for Galvanic Skin Response and is a method for measuring the electrical conductivity of the skin. It can be used to reflect human emotional activity. In the event of emotional stress or strong facial expressions, sympathetic activity increases and promotes sweat gland secretion, which increases the electrical conductivity of the skin. GSR allows us to detect such strong emotions simply by placing two electrodes on two fingers of one hand. It's an interesting tool to create projects related to emotions, such as B. Sleep quality monitors. Some galvanic skin response devices, such as B. lie detectors, this scientific principle also applies.

Fig. GSR Sensor

K. Thingspeak Server

Thingspeak server is an IoT Cloud Platform that lets us collect and store sensor data in the cloud and develop internet of things applications. Thingspeak is a free online data aggregation platform. Generally, Thingspeak is used to collect data from sensors. Thingspeak provides instant visualization of the data. It is a very popular for people who experimenting in IoT. Using Thingspeak we can create various fields, like measuring for temperature, Heartrate, pulse rate etc. Various sensor data we can able to see on thingspeak in the form of visuals. This data anyone can see on remote place using username and password



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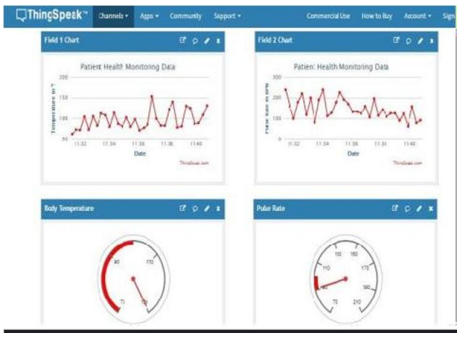
III. RESULT

The IoT-based Remote Health Monitoring System with Electrocardiograph accomplishes a proficient and simple. The following fields show the various parameters of the patient body on the ThingSpeak server. Which was measured through various sensors. Like body temperature, pulse rate, etc.



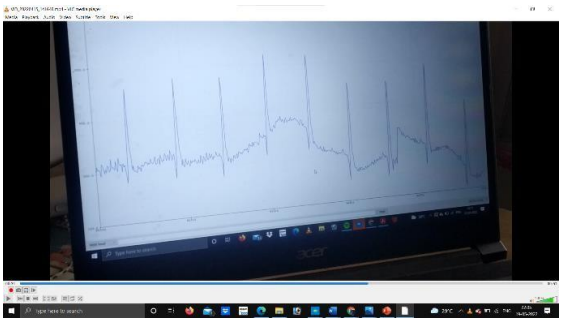


Fig. ECG Graph output.

IV. CONCLUSION

The IoT-based Remote Health Monitoring System with Electrocardiograph was designed and developed using Arduino. The program is effective and accurate. It detects all parameters using a variety of sensors such as heart rate, heart rate, blood pressure (BP), body temperature, ECG, and Depression. Based on the numbers of these sensors, the condition of the patients is calculated, and the information is transmitted using the IoT to the affected person's cell phone to take the necessary action. The improved model is more flexible and consumes less power. It is very useful in medical camps. From the project designed above, we can conclude that we are able to transfer audio data from remote patients toa physician's PC using wireless transmission technology. This can be of great help in the medical field and helps physicians to keep a close eye on the patient's health.

FUTURE SCOPE

We all know that the future scope of monitoring patient health through internet connectivity is emerging day by day as it helps in camps like medical teams in rescue camps in times of disaster. Unable to get bigger or bigger. Or as a large machine, this portable kit will be useful. Bioelectronics is entering the field of electronics or engineering as well as medical science.

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