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An Advanced Heart Attack Detection and Heartrate Monitoring Alert System using IoT

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Abstract: ***Internet of Things (IoT) plays a vital job in interfacing the encompassing environmental things to the organization and made easy to access those un-internet things from any far-off location. The human death because of heart attack is increasing day by day. Because of today's human way of life, eating habits, irregular daily schedules, the heart attack issue is becoming predominant. So here we planned a project which enables early recognition of heart attack and provide medical facilities pronto. This mainly centers around early detection of heart attack which thus lessens the human death rate because of heart attack. And by utilizing this gadget, one can screen heart rates which also assists with distinguishing heart attack.***

Keywords: Arduino uno, Heart attack, Internet of Things, Pulse, Temperature.

I. INTRODUCTION

Nowadays, people are losing their lives due to heart attack. Heart attack can occur when the flow of blood to the heart is blocked. Due to the late diagnosis of heart attack, we are incapable of saving the lives within that short period of time. In this article, we recommend an system that will identify heart attack by examining heart rate based on the Internet of Things (IoT). For a healthy adult, the normal heart rate is between 60 and 100 bpm (beats every moment). The athlete's heart rate generally oscillates between 40 and 60 bpm depending on his state of health. Assuming that an individual's heart rate is always consistently above 100 beats, the man or woman is stated to have better coronary heartrate which is likewise notorious as tachyarrhythmia. It can lower the functioning of heart which can result in chest-pain and lightheadedness. With the development in technology, it directly displays the patient's coronary heart rate on screen even at home. The human heart [12] is one of the most important organs in the body. It acts as a pump for circulating oxygen and blood at some point of the body, in the end safeguarding the capability of the body. A heartbeat may be characterized as a two-component pumping motion of the human heart which takes place for nearly a second. It is introduced due to the contraction of the coronary heart. Whenever blood gathers in top chambers, the SA(Sinoatrial) hub conveys an electrical sign which thusly reasons the atria to contract. This contraction then, at that point, pushes the blood via tricuspid and the mitral valves; this segment of the pumping framework is referred to as diastole. The following segment begins when the ventricles are completely loaded up with blood.

The alerts producing from SA hub attain the ventricle and make them to contract. Heart rate is an important parameter within the mechanism of coronary heart. Along those traces coronary heart charge monitoring is vital in the research of human heart's overall performance and its way to retaining heart's health. Furthermore, the data collected from the sensor is analyzed using a smartphone application called ECG analytics [2]. The Thing Speak platform allows for real-time monitoring of the heartbeat. To model a heart rate monitoring system, significant components such as a heart rate sensor, Wi-Fi Module, and Arduino are used. The alarm message is obtained by combining IoT with this through a heart rate application if a heart attack happens. The heart rate of participants between the ages of 20 and 80 is measured and analyzed [4]. The sensor's data is obtained by sensing the intensity of light. The sensor's output is processed in a hub before being transferred to the software display unit. This information is then saved to the SD card to keep track of the person's heart rate characteristics.

The pulse sensor is used in conjunction with a temperature sensor to monitor heart rate and detect heart attacks [5]. Based on the algorithm, an Arduino board is used. A GPS module is included to pinpoint the patient's exact position. The Android application is created, and communication is enabled by the Bluetooth module. To create a PPG (photoplethysmography), an IR sensor is combined with the hardware system and Arduino [6]. A fingertip is used to obtain the signals. Processing is the programme used for graphical representation and analysis. The sensor collects physiological data from the human body, a management unit is used to store and show the real-time data from the monitoring body [7]. The management unit can be used in conjunction with a local host network IoT system. The results are shown on a monitor, a smartphone, or a laptop. Arduino UNO, pulse sensor, LEDs, and Raspberry Pi 3[8] make up the hardware system. The data is monitored in real time using Thing Speak, an IoT platform. For heart rate measurement, an IR emitter-detector pair is utilized, and the sensor's output is amplified again by a 741 OP amp IC [9]. To remove noise from the signal, a low pass filter is used. On a personal computer screen, the ECG waveform can be seen. Through a Wi-Fi module, the data is uploaded to a database cloud. In the recent times, there are a plethora of health monitoring systems to choose from. Wireless transmissions, wearables, and portable remote health monitoring systems are a few among them [10].

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The health monitoring systems are devised to make health care facilities easily available, comfortable to the patients and most important information regarding the health status of the patient must be easily accessible to the doctor irrespective of his location.

II. LITERATURE SURVEY

Body fitness monitoring is crucial for us to ensure that our fitness is in great condition. One of the crucial parameters for this system is the feasible coronary heart rate (HR) which records different massive frame checking parameters including temperature, weight and circulatory pressure which might be accurate and appropriate factor to monitor fitness. In this challenge we depict the plan of minimum price coronary heart rate watching system from fingertips primarily based on Bluetooth innovation. The complete framework contains numerous components including Heart Rate module, Android utility and Bluetooth module. The Heart Rate (HR) module receives coronary heart rate signs from the subject(patients)by using Photoplethysmography procedure and then sends these signs remotely to PC or android by making use of the Bluetooth module. This framework can be a part of telemedicine constituent. These records from coronary heart rate modules can be made available for clinical usage. The results from this system's version may be used for numerous scientific investigations, those Bluetooth's signs may be transmitted for about 15 to 20 meters radius [1].

An approach and equipment for monitoring human heartrate change is implemented with a wearable system in this paper. The heartrate receiver receives heartbeat signals and stores the data in the database. After a certain period, this method can determine the monitoring body's idle heart rate. This idle heart rate is compared to the stored data, allowing the normal and abnormal heart rate variability to be determined. After a certain period, this system can detect the heart rate and send a signal to the user if there are any abnormalities. This framework can understand the coronary heart rate change and can also carry a message [7].

In the last two decades, mobile phone usage has increased exponentially across the globe and to provide adequate signal strength, the number of mobile phone towers also increased resulting in widespread speculation and concern among cell phone users and non-users. This paper provides a detailed account of the various biological effects such as heart diseases due to mobile tower radiation on humans and the norms adopted in various countries. Furthermore, various case studies and surveys that are conducted internationally addressing the alarming state of mobile tower radiation issue has been discussed and demonstrated [12].

III. PROPOSED SYSTEM

In this project, we will implement a heart rate monitoring and heart attack detection system using IoT. The patient will be wearing a hardware device with sensors. With that sensor we can check our heartbeat rates and monitor them. We must set threshold values i.e., the upper and lower points only then the framework starts to check the patient's pulse. If the pulse readings are not within the standard threshold limits, the framework alerts the client with a caution and a possibility of cardiovascular failure.

A. Block diagram:

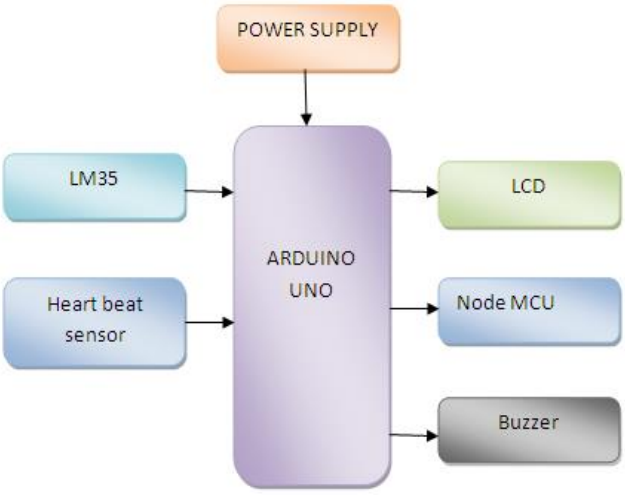

Fig 1: Device Setup

B. Methodology:

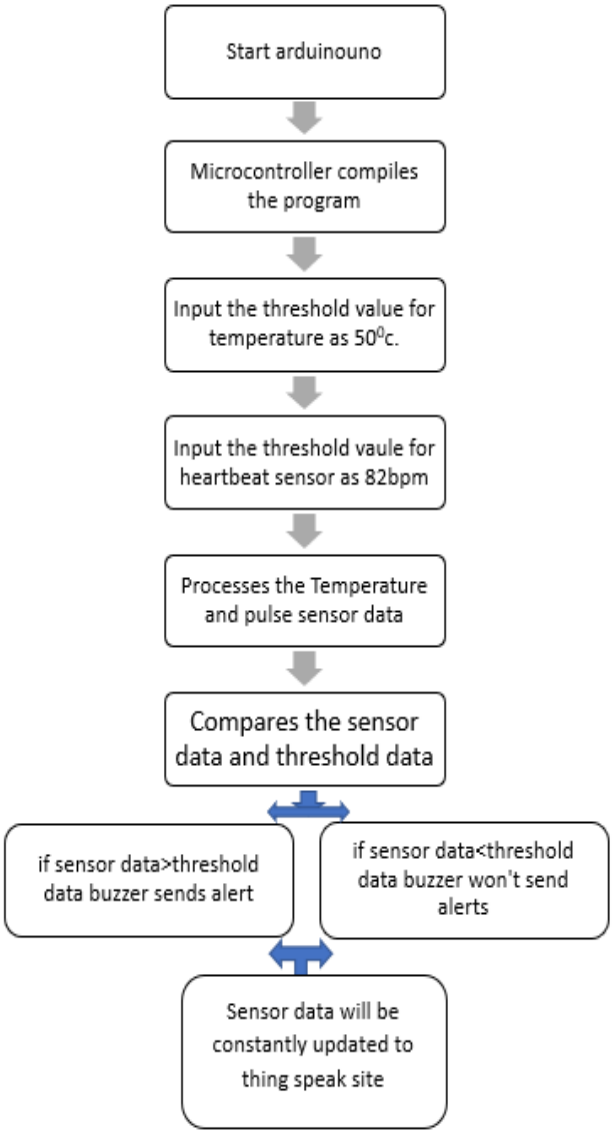

Fig 2: Methodology flow chart

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IV. MODULE DESCRIPTION

A. Pulse sensor:

The Pulse Sensor is a plug-in device which monitors heart rate. The sensor is attached to an ear cartilage or a fingertip via jumper links and it communicates with an Arduino board. It tends to be used by understudies, artists, athletes, makers, and sport and transportable designers. It basically joins a optical coronary heart rate sensor with amplification and clamor cancellation hardware, making it rapid in getting accurate heartrate readings.

Fig 1: Pulse sensor

B. Arduino uno:

The ATmega328P microcontroller is used in the Arduino UNO. In comparison to other boards, such as the Arduino Mega board, it is simple to use. Digital and analogue input/output pins (I/O), shields, and other circuitry make up the board.6 analogue pin inputs, 14 digital pins, a USB connection, a power jack, and an ICSP (In-Circuit Serial Programming) header are all included in the Arduino UNO. It's written in the IDE (Integrated Development Environment) programming language. It's compatible with both online and offline environments.

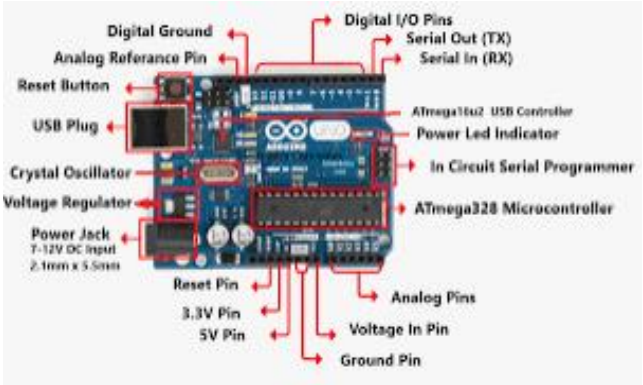

Fig 2: Hardware component Arduino uno

C. Node MCU ESP8266 Wi-Fi Module:

Node MCU uses environmental parameters to create a cheaper System-on-a-Chip (SoC) known as the ESP8266. The ESP8266, designed and implemented by Espressif Systems. It includes all the essential components of a computer: CPU, RAM, networking (Wi-Fi), and even an operating system and SDK. The ESP8266, on the other hand is similarly difficult to access and utilize as a chip. You'll need to patch wires to its pins with the appropriate basic voltage for the primary tasks.

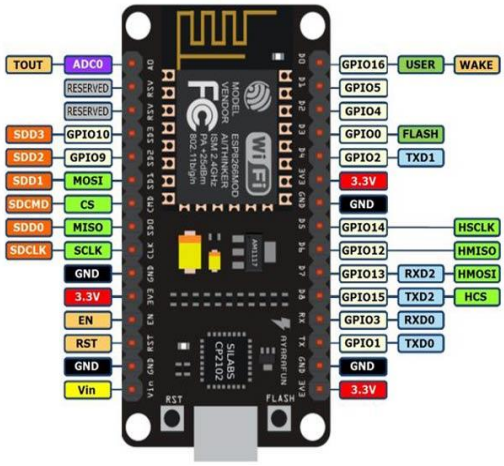

Fig 3: Node MCU

D. LM35 Temperature Sensor:

Temperature sensor is a device that measures the temperature of an object. Temperature sensors come in a variety of shapes and sizes, and they all use different technologies and standards to determine the temperature. The LM35 is a temperature sensor that produces an analogue signal. The result voltage may be decoded to provide a temperature reading in Celsius without much difficulty. The advantage of the lm35 over the thermistor is that it does not require external calibration. It is also protected against self-heating by the covering.

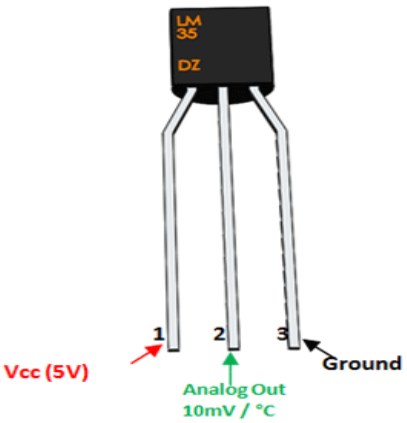

Fig 4: Temperature Sensor

V. RESULTS

In this paper, based on our research the outcomes are recorded i.e., temperature was 26°c and is considered normal as it lies within the threshold limit and heartbeat rate received was 72, it is considered normal as it lies within the threshold limit. Threshold values that were set accordingly are heartbeat rate is low if >40 and <60 and high if >72 and <100 and temperature vary from 25°c to 50°c. All these values will be updated in the thing speak website. By using the data stored on the website we can monitor the patient status continuously. The below figures show the hardware implementation of heart rate monitoring and heart attack detection of a person.

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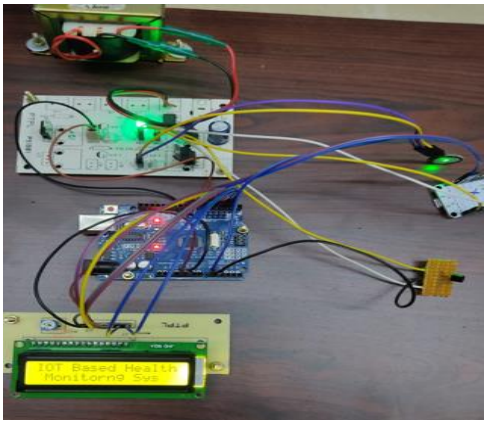

Fig 1: Hardware Implementation

The temperature sensor will continuously monitor the temperature of the person and it is displayed on LCD and updated in the web page through Wi-Fi module. -Fig2&3

Fig 2: Temperature Indication on LCD

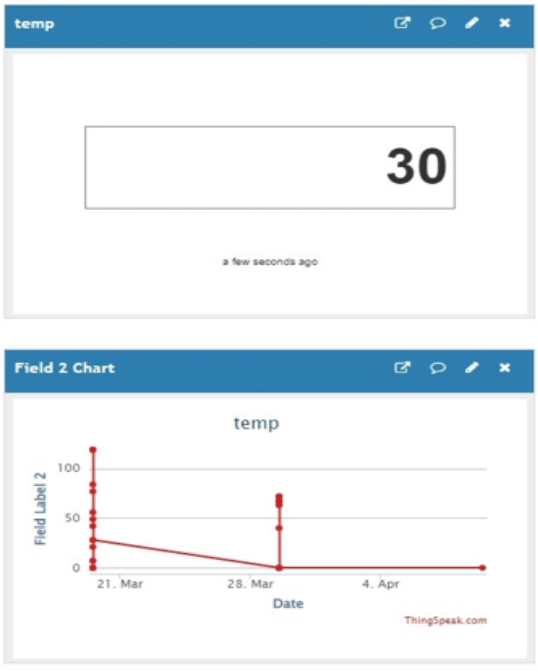

Fig 3: Temperature data updated in webpage

The Heartbeat sensor will continuously monitor the pulse of the person and it is displayed on LCD and updated in the web page through Wi-Fi Module-Fig 3&4

Fig 4: Heartbeat display on LCD

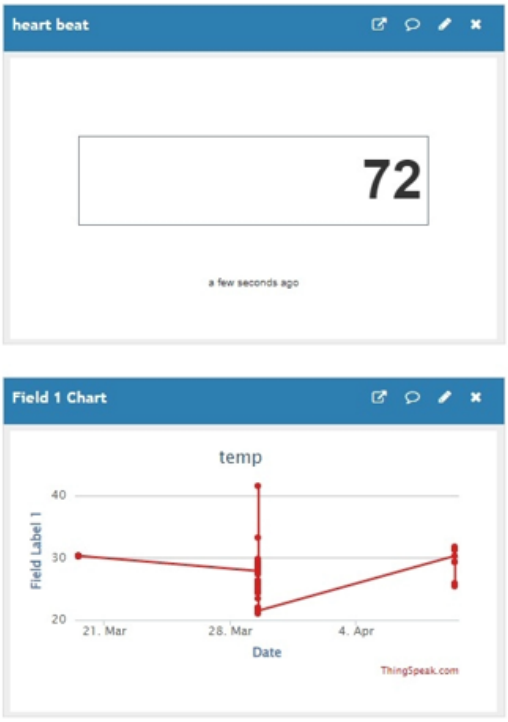

Fig 5: Heartbeat data updated in webpage

VI. CONCLUSION

In this paper, a real time heart rate tracking, and heart assault detection is developed by using IoT. The proposed system works fine on the sufferers of all ages with the help of real time heartrate tracking.

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It additionally provides protection and privacy to the data of an affected person. The proposed layout is applied because of the real time tracking system that enables in imparting, on-spot fitness care centers to the affected person by using the MQTT protocol and IFTTT protocol. Alerting system and area tracking are different functions of the layout. In addition to this a neighborhood server is used to offer protection, privacy, and occasional latency.

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