

# Heart Monitoring and Alarming System

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**Abstract:** Recent studies show that problems like heart attack, which usually happens in late 60's, now happening to adults because of their busy schedule and irregular lifestyle. Under these conditions, Internet of Things has given a much simpler answer for wireless real-time health monitoring of patients from the home and hospital. So what is the target of our research?

There are some cases in which patient died even in the ICU because of heart attack. ICU has all the advance machines to keep track of all the health-related parameters of patient but there is no mechanism to alert the doctors in case of event like these. Machines installed in ICU are only for monitoring purpose, not for analysis. Our device focuses on monitoring and data collection so as to provide better health related services and to reduce the mortalities.

To provide immediate medical assistance to a patient having heart trouble we are proposing a system via our device. Our device functions by observing heart rate, blood pressure, body temperature, respiration rate & body movement of the patient and if any of the variable crosses the threshold value a SMS will be send to the doctors instantly to alert them. Another remarkable area of the provided solution is to create ideal surroundings as per the requirement of patient's health condition. Using all the sensors it will collect the data and store it in cloud where it can be used for further research and analysis. The data collected can be used to study and predict the health of the patient.

**Keywords:** Body Temperature, Cloud, Heart rate, Internet of Things

## I. INTRODUCTION

Innovation and advanced science by method of developments has made life simpler for everyone in all aspects. The biggest of all is clinical sciences where the clinical workforce is currently ready to collect fundamental data of patients. Two of the foremost necessary are measure of temperature of body and heart rate. The Heart Rate Monitors (HRM) is tools that permit to realize a true time measure of heartbeat. They comprise a transmitter for detection of the heartbeat, by measuring the number of times the frequency of heartbeat and a receiver for determining the heartrate by analyzing the acquired signal from transmitter.

Vascular and heart infections are dramatically increasing because of the way of life and unhealthy consumption habits. Therefore, heart issues are on the rise of more youthful patients. Insights show that coronary illness is currently the main source of death. In a clinical domain, a pulse is estimated under isolated conditions by measuring blood, heart beat by making use of Stethoscope, and ECG, yet these strategies are

**Revised Manuscript Received on May 8, 2020.**

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costly and should be performed by an expert clinical workforce.

Heart attack is something in which patient need immediate medical assistance. Slight delay can lead to death of a patient. Patients having heart trouble are admitted in ICUs where they are under 24\*7, surveillance. There are machines that keep track of health parameters of patient. But none of them will alert the authorities in case of any abnormal reading which can lead to death of a patient.

R. Kumar et al. (2016): Has proposed a raspberry pi-controlled patient observing framework where heartbeat, breath, temperature and body development of the patient is being estimated utilizing sensors and showed on the screen utilizing the putty programming. Be that as it may, it doesn't contain the caution notice which has been included our proposed arrangement.

Sarfraz Fayaz Khan (2017): Has proposed a total and powerful human service monitoring framework utilizing IoT and RFID labels. In this framework, for directing and gauging the wellbeing state of the patient and for expanding the intensity of IoT, a blend of microcontroller and sensors has been utilized.

S. Siva et al. (2016): Have proposed an answer for screen patients' human services condition utilizing the keen medical clinic framework. The patients' wellbeing condition can be observed by methods for a sparkle pack. It records the temperature and pulse of the patient and triggers a ready framework if the parameters leave a specific recommended output than an alert is sent.

## II. METHODOLOGY

For early detection of heart attack, we need a single instrument which can measure all the major health parameters, analyze them and alert the authorities in case of any abnormalities. We have developed a system that will immediately send an alert to the doctor if a patient crosses a particular threshold level of the sensors used in the system and the device created is portable, cost friendly and can be used for surveillance all day.

System Architecture is divided into 3 modules:

Module 1: Data Collection

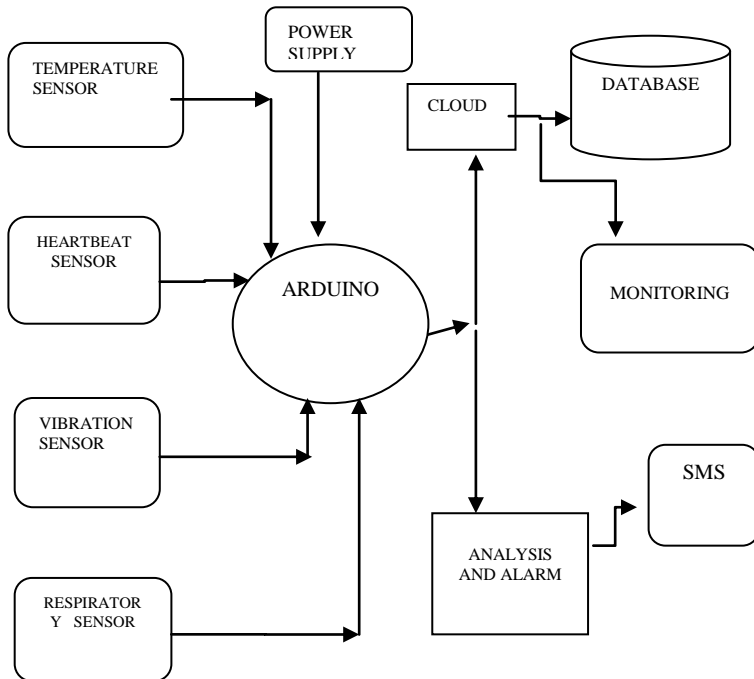
Sensors are instruments that are used to identify and respond to electrical or optical signals. A Sensor alters the physical conditions into a flag which can be evaluated electrically. In our project we are using 4 sensors which will monitor body temperature, heart rate, vibration in body and respiration.

## Module2: Monitoring & Storage

Data collected will be sent to a cloud for continuous monitoring and storage purpose. In every 15 seconds data will be uploaded to the cloud using Wi-Fi module.

## Module 3: Analysis & Alert

Data collected by sensors will be analyzed and if health parameter crosses the threshold values then a SMS will be sent to concerned authorities i.e. doctors by GSM module.



**Fig.1: System Architecture**

### III. TECHNICAL SPECIFICATION

#### A. Functional Requirements

ID	Requirement
REQ 1	The system is using an Arduino Uno board as an IDE to establish a connection between software and different sensor.
REQ 2	The system is using Arduino Uno software to structure the programs in segments of code to perform individual tasks.
REQ 3	The system is using a heartbeat pcb type sensor to measure the heartbeat of the patient
REQ 4	The heart beat pcb type sensor sparkles a light lobe and measures the light that get transmitted to the LDR
REQ 5	The system is using a GSM module to send alert messages if the patient is about get a heart attack
REQ 6	We insert a sim card in GSM module through the message will be sent in the registered mobile number
REQ 7	The system is using a vibration sensor to measure the acceleration of a body.
REQ 8	vibration sensor is used to detect and monitor vibration in the human body when an electronic system is placed on their body
REQ 9	The system is using a respiratory sensor to check the breathing amount of the patient.

REQ 10	The system is using a SMPS circuit (AC to DC converter) to control the output voltage by comparing it with the reference voltage
REQ 11	The system is using Temperature sensor to measure the body temperature in degrees Celsius
REQ 12	The system is using Wi-Fi module to establish a communication network between Arduino & cloud
REQ 13	Cloud is used to store the data of the system online.
REQ 14	Using cloud, we can store a history of records of the patient and can retrieve the data whenever required.

**Table 1-Functional Requirements**

#### B. Non-Functional Requirements

ID	Requirement
REQ15	If any of the parameter passes the set threshold value SMS will send to the doctors immediately to alert them
REQ16	Another reason of the proposed arrangement is to make the ideal surroundings according to the necessity of patient's health and medical condition.
REQ17	Another NFR is that the system created is portable and can be used for more than one place.
REQ18	Cloud computing used can store the data and can be used for future reference
REQ19	Immediate assistance would be provided to the patient by the doctor on alert
REQ20	Machine can be customized for future smart developments and can make the machine more reliable and can be modernized.

**Table 2-Non-Functional Requirements**

### IV. DESIGN APPROACH AND DETAILS

#### Hardware:

- A) Arduino Uno
- B) Heart Beat PCB Type Sensor
- C) GSM Module (SIM800C)
- D) Vibration Sensor
- E) Respiratory Sensor
- F) Switch Mode Power Supply (SMPS 220V-12V)
- G) Temperature Sensor (TMP-36)
- H) Wi-Fi Module (ESP 01) and Cloud

#### Software:

- A) Embedded C
- B) Arduino IDE

## System Description

### A. Arduino Uno

The Arduino UNO is an open-source microcontroller. We are using it as an interface for sensors in the project. It has a set of digital and analog pins which are 14 and 6 in number. Connections are made from sensors to the Arduino where output is given by the sensors and Arduino takes them as input and calculates the final output which is then displayed on the screen.

### B. Heart Beat PCB Type Sensor

The heart beat PCB type sensor is used in the project which measures the time cycle in heartbeat per minute. We need to place our finger in the sensor and a ray will pass through our finger which will be refracted by the refractor and sent back to the sensor which will complete one cycle.

### C. GSM Module (SIM800C)

GSM module is used to develop a connection between the system and GPRS. A number card is inserted in the module through which the message will be sent to receiver by the sensor.

### D. Vibration Sensor

Vibration Sensor is used to measure the vibrations in a person. It works on digital set of Arduino which gives the output as 0 or 1 which is then displayed on the computer screen.

### E. Respiratory Sensor

Respiratory sensor is used to check if the person is breathing or not. It is placed on the patient's mouth and a sensor attached to the respirator will measure the breathing level of the person and will send an output whether he is breathing or not breathing.

### F. Switch Mode Power Supply (SMPS 220V-12V)

SMPS is required in system to give appropriate amount of voltage required to process the system. It converts AC to DC from 220V to 12V which is then further connected to the Arduino as a power source. It acts as a small transformer for the system for providing required amount of voltage output.

### G. Temperature Sensor (TMP-36)

Temperature Sensor measures the body temperature and displays it on the screen; it works on analog pin which gives output based on voltage difference and this is converted to Celsius Temperature using " $Temp. = (val/1024.0)*5000$ " formula.

### H. Wi-Fi Module (ESP 01) and Cloud

Wi-Fi Module (ESP 01) is used to transfer data collected by Arduino to cloud server. Cloud computing helps the doctor to continuously monitor the health parameters of patients and data collected on the cloud server can be used for future references.

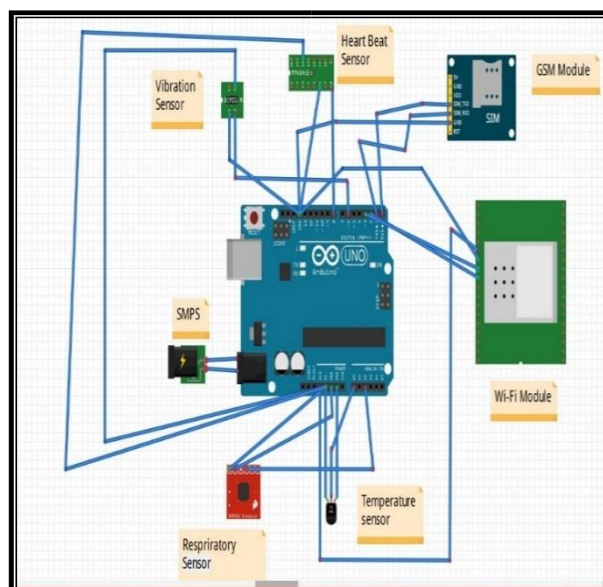


Fig.2: Circuit Diagram

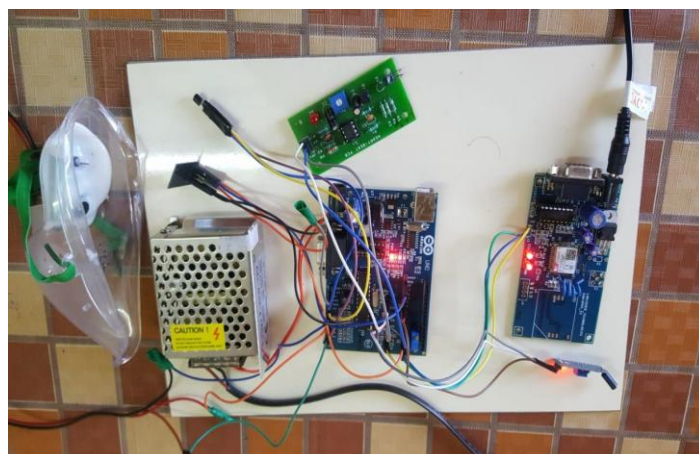


Fig.3: Hardware

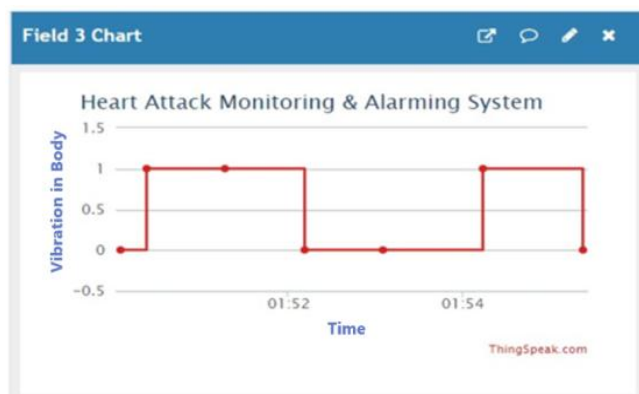


Fig.4: Cloud-Body Temperature





**Fig.5: Cloud-Heart Rate**



**Fig.6: Cloud-Vibration**

### V. RESULTS AND DISCUSSION

We have developed a cost-effective system that would continuously monitor the vital health parameters of the patient. The data collected by sensors are continuously transmitted to cloud so that all the patients can be properly monitored. Data will be analyzed and if health parameter is crossing the threshold value then an immediate alert in form of SMS will be sending to the concerned authorities. The system created is portable, cost friendly and can be used for monitoring for all the major health parameters of the patient. Technological advancements in medical science are mostly available to rich or upper class of our society. The main reason of this is the high cost of treatments and equipment's. On one hand India is famous for its medical tourism and on other our own people do not have proper access to basic health care facilities. As we are a developing country it is not possible for government to install high end equipment in all the government hospitals. We need innovation and technology to address the gap between rich and poor in respect to access of health care facilities. To make health care facilities accessible to everyone we need to rebuild the present equipment's in the market in such a manner that their cost can minimize as much as possible without compromising in their functionalities.

### VI. CONCLUSION

An estimated 18 million people died from CVDs, representing 34% of all global deaths. Our vision is to contribute towards reduction in the mortalities resulting from CVDs. To achieve the same, we have successfully developed an advanced IOT based automated heart attack monitoring and alarming system which can be used in hospitals to provide equal attention to all patients. An important feature in the

developed system is that the heart condition of the patients can be easily tracked from the control room of the hospital and an immediate alert will be sent to the doctors in case of any emergency. This system not only monitors the patient but also collects the data for further analysis, based on which urgent and important steps can be taken for betterment of the patient.

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