

# IoT Based Health Care Monitoring System

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**Abstract** - In present days health related issues have been regarded as one of the main problem in society. Some of the people having health problems have to go for checkup regularly to hospital but they are not able to go due to their personal problems and some of the patients cannot reach the hospital in time when they are in emergency condition. This leads to death. To overcome from this type of problems we are using IOT technology. IOT is advanced technology useful for the medical health sector in many ways. It offers smart, reliable, and effective healthcare service to the patients. We Provide solution through IOT based Health Care monitoring system. This helps to know the condition of the patient wherever patient may be by attaching some sensors to the patient body.

Hence, the proposed IOT based Health Care Monitoring System collects the sensor data through Arduino microcontroller and relays it to the cloud where it is processed and analyzed for remote viewing. Feedback actions based on the analyzed data can be send back to the doctor or guardian through SMS alerts in case of any emergencies.

**Key words:** Health Monitoring, IoT, Sensors, GSM Module.

## 1. INTRODUCTION

Most humans live a busy life in which going to a doctor for weekly or even monthly check-up is an impossible task. Without monitoring your health, it is not possible to whether you are a healthy or sick person. This problem leads to the design of prototype.

This monitors your health every day without going to a doctor. Previously it is impossible to monitor the patient by doctor in remote areas during critical conditions.

Therefore, we introduced IoT System, which continuously monitors the patient condition and automatically sends the data to server, so the doctor can access the data continuously and we can intimate caretaker when patient is in critical condition.

Patient Health monitoring using IOT is a technology to enable monitoring of patients outside of conventional clinical settings (e.g. in the home), which may increase access to care and decrease health care delivery costs.

This can significantly improve an individual's quality of life. It allows patients to maintain independence, prevent complications, and minimize personal costs. This system facilitates these goals by delivering care right to the home. In addition, patients and their family members feel comfort knowing that they are being monitored and will be supported if a problem arises.

Hence, to overcome from this type of problems we provide Monitoring System. This helps to know the condition of the patient wherever patient may be by attaching some sensors to the patient body [1].

## 2. LITERATURE SURVEY

Nowadays it has become important to focus on health care awareness and the growth of wireless mobile technologies. For this reason ubiquitous health care solutions has become important as it provides services at anytime and anywhere. Heart-related diseases are on the rise. Cardiac arrest is quoted as the major

contributor to the sudden and unexpected death rate in the modern stress filled lifestyle around the globe. Daily monitoring of health condition at home is important for an effective scheme for early diagnosis, treatment, and prevention of lifestyle-related diseases such as adiposis, diabetes and cardiovascular diseases.

In the recent years wireless technology has increasing for the need of upholding various sectors. In these recent years IOT gripped the most of industrial area specially automation and control. In traditional method, doctors play an important role in health checkup. For this process requires a lot of time for registration, appointment and then checkup. In addition, reports are generated later. Due to this lengthy process, working people tend to ignore the checkups or postpone it. This modern approach reduces time consumption in the process.

This is achievable by deploying advances in wireless technology to the existing patient monitoring system. This IOT based Health Care Monitoring System proposes the development of a module that provides mobility to the doctor and the patient, by adopting a simple and popular technique, detecting the abnormalities in the bio signal of the patient in advance and sending an SMS alert to the doctor through Global System for Mobile (GSM).

Hence, patients who are at risk require that their cardiac health to be monitored frequently whether they are indoors or outdoors so that emergency treatment is possible.

- To study both IoT and cloud computing technology with improved information and communication processes.
- To study Advance technology about poly-house automation in the aspect of monitoring and controlling both environmental parameters and biological parameters automatically Poly-house cultivation is mostly monitored manually.
- To study patient's health how to collect health data through sensor and transfer into local server or cloud and automatic controlling mechanism.

The literature survey is a progressive step to understand the work focused by number of researchers. The work is shown in the following as

Almotiri et.al, proposed android based m-health monitoring system for collecting the device information with enabling of internet. This device is useful in the medical diagnosis for understanding the previous health report.

Barger et.al, proposed a smart facility in the house for tracking the movements of the patient. This system is mainly developed to understand the behavioral patterns of the patient.

Dwivedi et.al., proposed a framework to secure the data processing to the electronic health record by combining public key infrastructure, API, Biometric and smart card solutions.

Khalifa Al Sharqi et.al discussed that the many people of the World are out of the reach of existing health care systems. To solve these problems many research and commercial versions of RHCMS have been proposed and implemented. In these systems, the performance was the main issue in order to accurately measure, record, and analyze patients' data [2].

Amna Abdullah et.al discussed the health care monitoring system was to develop a reliable patient monitoring system so that the health care professionals can monitor their patients, who are either hospitalized or executing their normal daily life activities.

Hamid Al-Hamadi and Ing-Ray Chen et al gives trust based health IOT protocol that considers risk classification, reliability trust, and loss of health probability as design dimensions for decision-making. Comparative analysis of trust based protocol and baseline protocols to check feasibility.

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Jennifer Yick WSN can improve existing health care and patient monitoring. Five prototype designs have been developed for applications such as infant monitoring, alerting the deaf, blood pressure monitoring and tracking, and fire-fighter vital sign monitoring. The prototypes used two types of motes: T-mote sky devices and SHIMMER (Intel Digital Health Group's Sensing Health with Intelligence, Modularity, Mobility, and Experimental Re-usability).

Abhilasha Ingole, Shrikant Ambatkar it is based on basic health parameter monitoring without using heavy or bulky system. The credit card size minicomputer placed beside the patient's bed with power and results can see on the screen of computer, which is in the same area network. It provides readings of body temperature and heart beat.

S. J. Jung and W. Y. Chung studied the Flexible and scalable patient's health monitoring system in 6LoWPAN. The main advantage of this enabling factor is the combination of some technologies and communications solution. The results of Internet of Things are synergetic activities gathered in various fields of knowledge like telecommunications, informatics and electronics [8].

### 3. EXISTING SYSTEM:

In the existing system, we use active network technology to connect various sensors to a single PMS. Patients' health conditions are continuously monitored via single PMS and reported to the doctors.

The sensors are attached to the body of the patients without causing any discomfort to them. In this PMS we monitor the important physical parameters like body temperature, ECG, heart beat rate and blood pressure using the sensors, which are readily available.

In this PMS we monitor the important physical parameters like body temperature, ECG, heart beat rate and blood pressure using the sensors, which are readily available. Thus, the analog values that are sensed by the different sensors are then given to a microcontroller attached to it. The microcontroller processes these

analog signal values of health parameters separately and converts it to digital values using ADC converter.

Now, the digitalized values from more than one microcontroller are sent to the Central PMS. Each of the sensors attached microcontroller with a transceiver will act as a module, which has its own unique ID. Each module transmits the data wirelessly to the gateway attached to the PC of the Central PMS. The gateway is attached to the PC i.e. Central PMS, which is situated in the medical center, is capable for selecting different patient IDs and allowing the gateway to receive different physical parameter values the patient specified by the ID.

The software designed using Graphical User Interface (GUI) can operate on different physical parameters of each patient, consecutively with a specified time interval for each patient [3].

At any time, any of the doctors or nurses can log on the Central PMS and check the history of the observed critical parameters of any of the patient attached to the network.

### Disadvantages

- In the existing system, we use active network technology to connect various sensors to a single PMS. Patients' health conditions are continuously monitored via single PMS and reported to the doctors.
- The sensors are attached to the body of the patients without causing any discomfort to them. In this PMS we monitor the important physical parameters like body temperature, ECG, heart beat rate and blood pressure using the sensors which are readily available.

### 4. RELATED WORK

Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Overall product architecture, the subsystems that compose the product, and the way subsystems are allocated to processors are depicted using the System Design. UML is used to model system designs.

Unified Modelling Language is a standard object-oriented analysis and design language. Use Case diagram and Sequence diagram, which are types of UML diagrams, of the application are shown below.

In this chapter, the design of the proposed system and the system architecture has been discussed. Proposed system architecture.

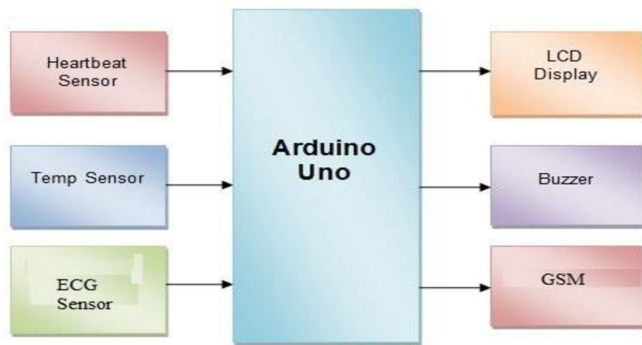


Figure.1: IoT Based Health Monitoring

The above figure shows the overall design of the IoT based health monitoring Physical view of sensors deployments like temperature, heartbeat, ECG, mems sensors etc. sensors are senses the temperature or heart beat and send a signal to Arduino Uno. Arduino-UNO has inbuilt Atmega8 processor which process the data and send it to a local server as well as Cloud server through GPRS. The user can also set a limit range of parameter and if the parameter goes beyond that value then it will give the signal to the corresponding controlling device and it will display on the targeted device automatically [4].

#### Procedure to use Thingspeak:

Open <https://thingspeak.com/> and click on the “Get Started Now” button on the centre of the page and you will be redirected to the sign-up page (you will reach the same page when you click the “Sign Up” button on the extreme right). Fill out the required details and click on the “Create Account” button.

#### Data Storage and Analysis Unit

The data storage unit involves storing the data in the cloud storage platform from which the data can be extracted for future use. The data received by the cloud storage system is stored there The saved data can be periodically analysed to predict situations of the patient.

#### Data Monitoring and Automation Unit:

The data display unit involves the displaying of the data obtained from the sensors to the users. The data stored in the cloud storage is displayed on the application in the smartphones. The user can see the data values that are obtained from the sensors in a graphical charts form and the system will take necessary actions based on these values

#### Problem Specification:

The existing system of health is mostly monitored manually and that is after being visited a hospital. Today every person needs immediate alert and the same to be conveyed to the doctor to take immediate steps for further medical assistance without the involvement of the patient.

But every person does not have the exact knowledge of health precautions. In this thesis, a Sensor Network is designed and implemented using Arduino Programming, Cloud storage, System App.

The system features optimizing four parameters inside the body temperature, heartbeat, ECG, fall detection. In order to measure these parameters, suitable sensors are fixed to the respective candidate for monitoring health conditions. A microcontroller receives the data from the sensors and transmits the data through Gprs. At the receiver's end, the transmitted data is received by the receiver which is read into the serial port of the system using a microcontroller.

#### Advantage of the Proposed System:

- The main aim is to design a IoT based health care monitoring system with two-way communication i.e. not only the patient's data will be sent to the doctor through SMS and email on emergencies, but also the doctor can send required suggestions to the patient or guardians through SMS or Call or Emails.
- A place in the hospital where very ill patients are monitored very closely.

- A patient can be analyzed by doctors in any part of the hospital wherever they are.

### Cloud Services

A cloud service is any service made available to users on demand via the Internet from a cloud computing provider's servers as opposed to being provided from a company's own on-premises servers. Cloud services are designed to provide easy, scalable access to applications, resources and services, and are fully managed by a cloud services provider [7].

There are various modules in the proposed system:

### Monitoring

Using this monitoring system user can know the current health conditions of the candidate remotely through an application on a mobile device. The main objective of the proposed system is:

- Provides time to time updates of the information obtained from sensors to cloud.
- Allows the doctor to monitor his patient's/candidate's health.
- We can remotely monitor all the above parameters on a mobile device through the internet.

### Controlling

Depending on the parameters obtained through monitoring we should be able to understand the patient's health

Here when a threshold value is reached a notification is sent to the doctor. Now the user can manually get the information manually. In this module controlling health is not possible.

### Objectives

- To Develop a monitoring system to observe health parameters using cloud-based technology with the help of IoT
- To Develop an automatic mechanism for

getting the information regarding the health condition of the candidates without their involvement

- To Design User interface between doctor and sensor that doctor can view the information through mobile /electronic components by searching: <https://thingspeak.com/channels/1021026>.

### Functional Requirements:

- Application must have a module for login using unique credentials of a patient for the doctor to monitor patient's vital data.
- Application must have a module for login using unique credentials of a patient for Guardian/Caretaker to monitor patient's vital data.
- Messaging Service: Hardware must have GSM module which send's SMS alert messages to doctor or guardians upon any emergencies and they can view the patient condition by searching <https://thingspeak.com/channels/1021026>.
- Application must have a module for login using unique credentials of a patient for Caretaker to monitor patient's vital data.

### Data Acquisition and Transfer Unit:

The core of this unit is the data acquisition card i.e. the microcontroller. NODEMCU ESP8266 is the microcontroller used in the system to which the sensors are interfaced to it using the breadboard and connecting wires [6]. The sensors used to monitor greenhouse are as follows:

- Heart beat Sensor
- Temperature Sensor
- ECG Sensor
- Mems
- Emergency Button

Initially, the micro-controller is loaded with a program that enables it to read the data from the data pins of the sensors.

## ThingSpeak:

Thing Speak is a platform providing various services exclusively targeted for building IoT applications. It offers the capabilities of real-time data collection, visualizing the collected data in the form of charts, ability to create plugins and apps for collaborating with web services, social network and other APIs. To use ThingSpeak, we need to sign up and create a channel. Once we have a channel, we can send the data, allow ThingSpeak to process it and also retrieve the same [5].

## Procedure to use Thingspeak:

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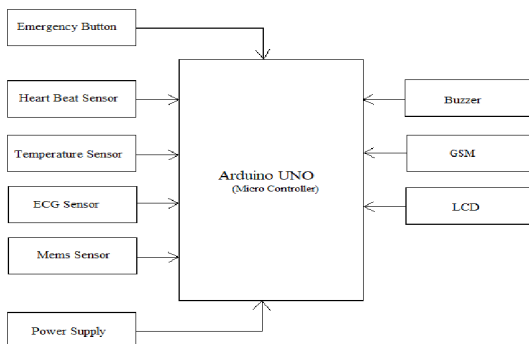


Figure.2: Block Diagram of Hardware Components

## Hardware setup:



Figure .2: Hardware Setup

## Temperature Sensor connection with Arduino:

Here the Temperature sensor consists of three pins. The below table describes the various pin connection of the Temperature sensor with the microcontroller.

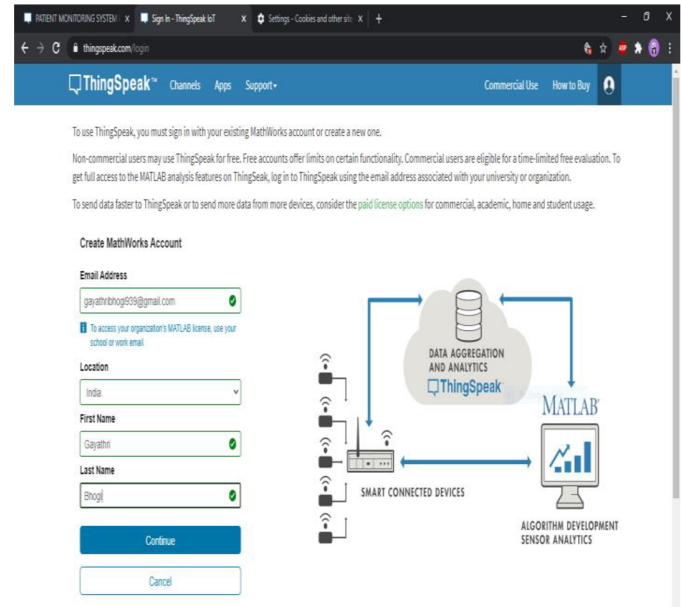


Figure .3: Integrating with the cloud (!)

Now you should see a page with a confirmation that the account was successfully created. The confirmation message disappears after a few seconds and the final page should look as in the below screen:

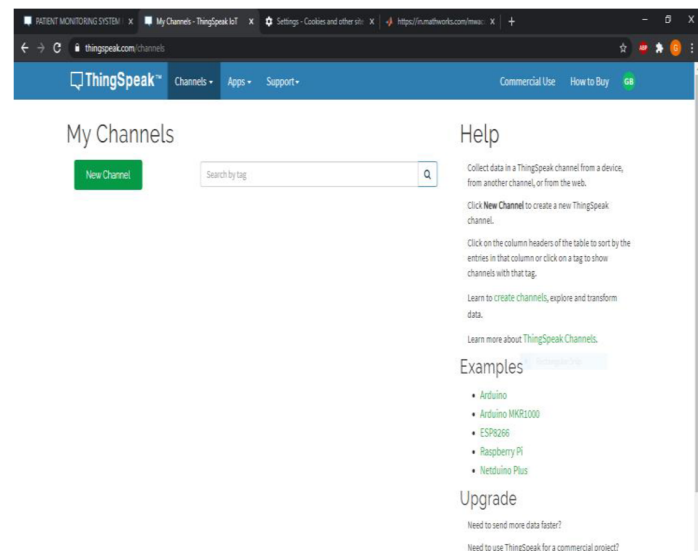


Figure .3: Integrating with the cloud (2)

Go ahead and click on “New Channel”. You should see a page like the below:

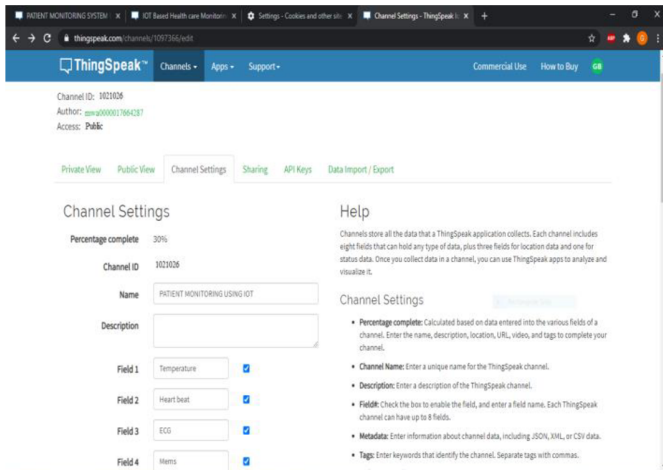


Figure .4: Integrating with the cloud (3)

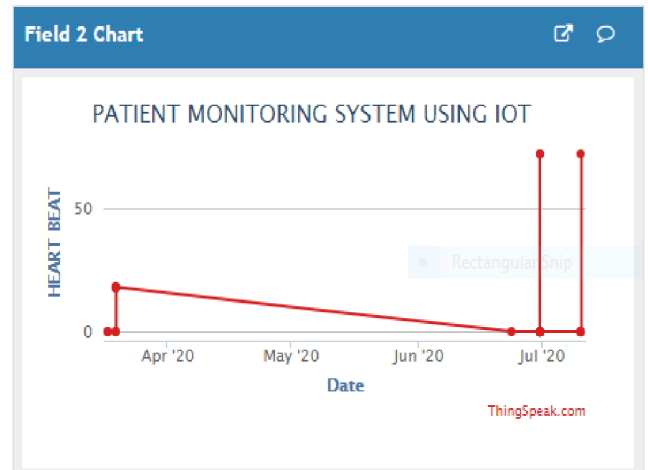


Figure.7: Heart beat data from Cloud

Once you have edited the fields, click on “Save Channel” button.

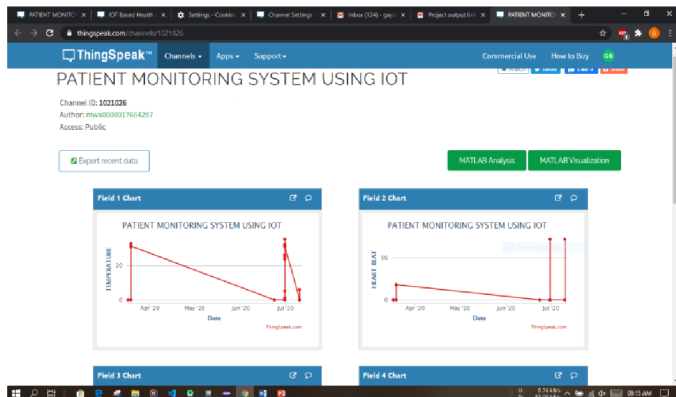


Figure .5: Integrating with the cloud (4)

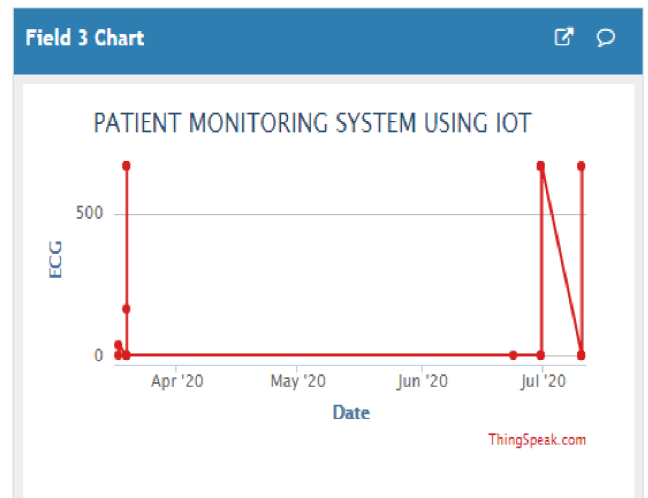


Figure.8: ECG data from Cloud

## 5. RESULTS

### GRAPHICAL USER INTERFACE

Various Sensor readings at ThingSpeak cloud platform (Webview)

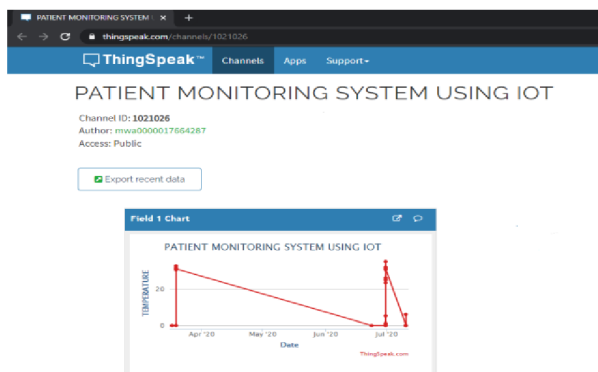


Figure. 6: Temperature data from Cloud

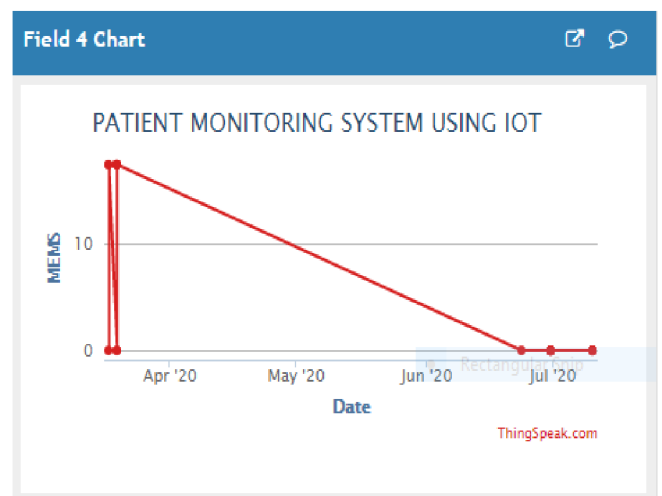


Figure.9: Mems data from Cloud

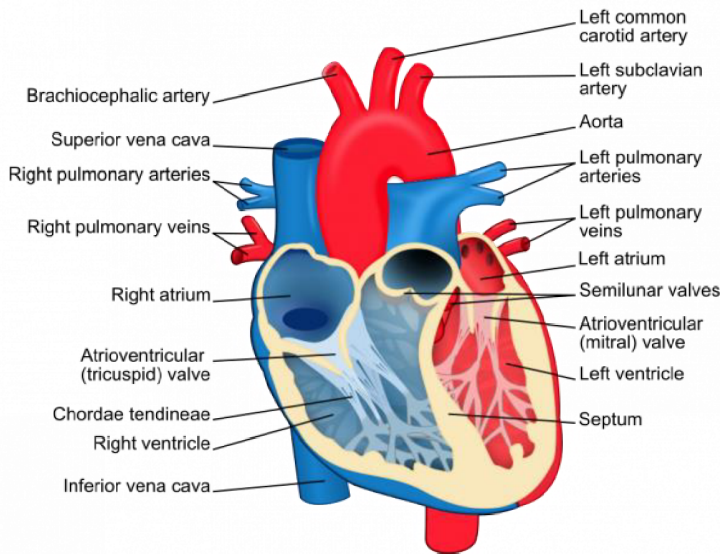


Figure. 9: Heart Diagram

## 6. CONCLUSION:

In this project, sensors are used to collect the data related to the parameters - temperature, heartbeat, ecg, mems. In the data acquisition unit, the data is collected from the sensors and transmitted to the server database using GPRS. In the data display unit, the data from the storage unit can be displayed on the control panel. Using this data values further action can be taken based on the necessity. This data can be further used for the analytical process and for prediction. The data analysis provides the patient's health condition.

This project presents the health monitoring system using an embedded system. Features associated with it are need of doctors are less, easy to operate, the multipurpose system used to measure the different parameters. With its potential use in the hospitals and home healthcare fields, wireless sensor networks have an important role in improving the lives of patients.

### Future Enhancement

This system can be further enhanced by adding response from the doctor automatically to send to the patient with a particular prescription or suggestion based on the status of the patient.

In addition to the above sensors, some other sensors can also be added in future such as CGM sensor. This system can also be developed as an application of Health Monitoring System in the future. It is likely that doctors and nurses would want to be mobile. When

they visit a patient they could have a tablet PC with all the current charts and data for that particular patient ready. The architecture for supporting this could be designed in different ways.

## REFERENCES

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