



# **NEW HORIZON COLLEGE OF ENGINEERING**

Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC  
Accredited by **NAAC** with 'A' Grade.

## **PATIENT HEALTH MONITORING SYSTEM**

**A MINI PROJECT**

**REPORT**

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In partial fulfilment for the award of the degree of

**BACHELOR OF ENGINEERING**  
IN  
**ELECTRONICS AND COMMUNICATION ENGINEERING**

# NEW HORIZON COLLEGE OF ENGINEERING

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING



### CERTIFICATE

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The mini project report has been approved as it satisfies the academic requirements in respect of mini project work prescribed for the said degree.

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## Abstract

With an improvement in innovation and scaling down of sensors, there have been endeavors to use the new innovation in different zones to improve the nature of human life. One primary zone of research that has seen an appropriation of the innovation is the social insurance area. The individuals needing social insurance administrations think that its extravagant this is especially evident in creating nations. Accordingly, this venture is an endeavor to take care of a medicinal services issue presently society is confronting. The principle goal of the undertaking was to plan a remote social insurance framework. It's contained three fundamental parts. The initial segment being, location of patient's vitals utilizing sensors, second for sending information to distributed storage and the last part was giving the identified information to remote review. Remote survey of the information empowers a specialist or gatekeeper to screen a patient's wellbeing progress away from medical clinic premises. The Internet of Things (IoT) ideas have been broadly used to interconnect the accessible clinical assets and offer savvy, dependable, and compelling social insurance administration to the patients. Wellbeing observing for dynamic and helped living is one of the ideal models that can utilize the IoT focal points to improve the patient's way of life. In this undertaking, I have introduced an IoT design modified for human services applications. The point of the venture was to thought of a Remote Health Monitoring System that can be made with locally accessible sensors with the end goal of making it moderate if it somehow happened to be mass delivered.

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## CHAPTER 1- INTRODUCTION

A Remote wellbeing checking framework is an expansion of a clinic clinical framework where a patient's imperative body state can be observed remotely. Customarily the recognition frameworks were just found in emergency clinics and were portrayed by immense and complex hardware which required high force utilization. Persistent advances in the semiconductor innovation industry have prompted sensors and microcontrollers that are littler in size, quicker in activity, low in power utilization and moderate in cost. This has additionally observed advancement in the remote checking of indispensable life indications of patients particularly the older. The remote wellbeing observing framework can be applied in the accompanying situations:

A patient is known to have an ailment with unsteady administrative body framework. This is in situations where another medication is being acquainted with a patient. A patient is inclined to cardiovascular failures or may have endured one preceding. The vitals might be checked to foresee and alarm ahead of time any sign of the body status. Critical body organ circumstance .The circumstance prompting the improvement of an unsafe perilous condition. This is for individuals at a propelled age and perhaps having bombing wellbeing conditions. Athletes during preparing. To realize which preparing systems will create better outcomes.

Lately, a few frameworks have come up to address the issue of remote wellbeing observing. The frameworks have a remote location framework that sends the sensor data remotely to a remote server. Some even received a help model that expects one to pay a membership charge. In creating nations, this is an obstruction as certain individuals can't utilize them because of cost issue included. There is likewise the issue of web network where a few frameworks to work, great quality web for a continuous remote association is required. Web entrance is as yet an issue in creating nations. A significant number of the frameworks were presented in the created nations where the foundation is working splendidly. By and large, the frameworks are adjusted to work in creating nations. To diminish a portion of these issues there is have to move toward the remote identification from a ground-up way to deal with suit the essential insignificant conditions directly accessible in creating nations.

A basic patient checking framework configuration can be drawn closer by the quantity of parameters it can recognize. In certain occasions, by recognizing one parameter a few readings

can be determined. For effortlessness contemplations parameter location are: Single parameter monitoring system:

In this instance, a single parameter is monitored e.g. Electrocardiogram (ECG) reading. From the ECG or heartbeat detection, several readings can be got depending on the algorithm used.

An ECG reading can give the heart rate and oxygen saturation.

i) Multi-parameter observing framework:

This has different parameters being observed simultaneously. A case of such a framework can be found in High Dependency Units (HDU), Intensive Care Units (ICU), during the medical procedure at an emergency clinic theater or Post medical procedure recuperation units in Hospitals. A few parameters that are checked incorporate the ECG, circulatory strain, breath rate. The Multiparameter checking framework fundamentally confirmation that a patient is alive or recuperating. In creating nations, soon after resigning from their every day vocation routine dominant part of the older age gathering, move to the provincial zones. In created nations, they may move to helped living gathering homes. This is the place a remote wellbeing observing framework can prove to be useful.



## **CHAPTER-2: Problem Statement & Objective**

### **2.1: Problem statement**

Remote wellbeing observing can give helpful physiological data in the home. This observing is helpful for older or incessantly sick patients who might want to evade a long clinic remain. Remote sensors are utilized to gather and transmit signs of intrigue and a processor is customized to get and consequently investigate the sensor signals. In this venture, you are to pick proper sensors as indicated by what you might want to recognize and plan calculations to understand your recognition. Models are the location of a fall, observing cardiovascular signs. Utilizing a solitary parameter observing framework a way to deal with a remote wellbeing checking framework was structured that broadens human services from the customary facility or medical clinic setting to the patient's home. The framework was to gather a heartbeat recognition framework information, fall discovery framework information, temperature information and barely any different parameters. The information from the single parameter checking frameworks was then benefited for remote location.

During plan the accompanying attributes of things to come clinical applications followed:

Integration with current trends in medical practices and technology,

- a) Real-time, long-term, remote monitoring, miniature, wearable sensors and long battery life of a designed device.
- b) Assistance to the elderly and chronic patients. The device should be easy to use with minimal buttons.

Structure a Remote Patient Health Monitoring System (RPHMS) which has heartbeat discovery framework, a fall location framework, temperature recognition framework, a stickiness identification framework, a harmful gas and air quality recognition framework and SPO2 discovery framework. A specialist or wellbeing pro can utilize the framework to screen remotely of all imperative wellbeing parameters of the patient or individual of intrigue.

An endeavor at planning a remote social insurance framework made with locally accessible parts.

- i) The fall identifier, temperature, mugginess, pressure, poisonous gas, air quality control, SPO2 modules involve an accelerometer, remote transmitter and microcontroller. The information gathered was transmitted remotely to a collector module.

- ii) ECG comprises of a non-intrusive infrared finger indicator, Liquid Crystal Display (LCD), a planned circuit for heart signal location and microcontroller. The distinguished simple sign was then digitized to give a computerized esteem that was perused on the LCD.
- iii) A straightforward cloud server where facilitated with a database for all the imperative information to be gotten to remotely at whatever point required.

## 2.2 Objective of the study

Here the main objective is to design a Remote Patient Health Monitoring System to diagnose the health condition of the patients. Giving care and health assistance to the laid up patients at basic stages with cutting edge clinical offices have gotten one of the serious issues in the advanced chaotic world. In clinics where numerous patients whose states of being must be observed every now and again as a piece of a symptomatic method, the requirement for a financially savvy and quick reacting ready instrument is unavoidable. Appropriate usage of such frameworks can give auspicious admonitions to the clinical staffs and specialists and their administration can be actuated in the event of health related crises. Present-day frameworks use sensors that are designed to a PC close to the bed.

The utilization of sensors recognizes the states of the patient and the information is gathered and moved utilizing a microcontroller. Specialists and medical caretakers need to visit the patient much of the time to analyze his/her present condition. Likewise, utilization of various microcontroller based keen framework gives elevated level materialness in medical clinics where numerous patients must be regularly checked. For this, here we utilize arrange innovation with remote relevance, giving every patient a one of a kind ID by which the specialist can without much of a stretch recognize the patient and his/her status of wellbeing parameters. Utilizing the proposed framework, information can be sent remotely to the Patient Monitoring System, permitting ceaseless checking of the patient. Contributing exactness in estimations and giving security in legitimate ready instrument give this framework a more elevated level of consumer loyalty and ease execution in emergency clinics. In this way, the patient can take part in his every day exercises in an agreeable air where interruptions of designed sensors are absent. Physiological checking equipment can be handily actualized utilizing basic interfaces of the sensors with a Microcontroller and can viably be utilized for social insurance observing. This will permit advancement of such ease gadgets dependent on characteristic human-PC interfaces. The framework we proposed here is productive in observing the distinctive physical parameters of many number out of commission patients and afterward in alarming the concerned clinical specialists if these parameters bob over its predefined basic qualities. Along these lines, remote

observing and control allude to a field of mechanical robotization that is entering another period with **the advancement of remote detecting gadgets.**

**The Internet of Things (IoT)** stage offers a promising innovation to accomplish the social insurance benefits, and can additionally improve the clinical assistance frameworks. IoT wearable stages can be utilized to gather the required data of the client and its surrounding condition and convey such data remotely, where it is handled or put away for following the historical backdrop of the client. Such a network with outer gadgets and administrations will take into consideration taking preventive measure (e.g., after anticipating an up and coming heart stroke) or give quick consideration (e.g., when a client falls and needs assistance)

## **Chapter 3 - Literature review**

### **3.1 Development and Clinical Evaluation of a Home Healthcare System Measuring in Toilet, Bathtub and Bed without Attachment of Any Biological Sensors**

Day by day observing of wellbeing condition at home is significant for a powerful plan for early determination, treatment, and anticipation of way of life related sicknesses, for example, adiposis, diabetes and cardiovascular ailments. While numerous monetarily accessible gadgets for home social insurance observing are generally utilized, those are unwieldy as far as selfconnection of natural sensors and self-activity of them. From this perspective, we have been building up a non-cognizant physiological observing framework without connection of any sensors to the human body just as any tasks for the estimation. We built up certain gadgets introduced in a latrine, a shower, and a bed and demonstrated their high estimation exactness by examination with synchronous accounts of conventional organic sensors legitimately connected to the body. To explore that materialness to the wellbeing condition observing, we built up a checking framework in mix with all the observing gadgets at medical clinic rooms and recently completed the estimations of patients' wellbeing condition. Further, in this investigation, the wellbeing conditions were estimated in 10 patients with cardiovascular ailment or rest issue. From these outcomes, the patients' wellbeing conditions, for example, the body and discharge weight in the can, the ECG during washing up and the beat and breath rate during dozing were effectively checked in the medical clinic room, exhibiting its helpfulness for observing the wellbeing state of the subjects with cardiovascular illness or rest issue.

### **3.2 Intelligent wireless mobile patient monitoring system**

These days, Heart-related illnesses are on the ascent. Heart failure is cited as the significant supporter of the abrupt and unforeseen passing rate in the advanced pressure filled way of life around the world. A framework that cautions the individual about the beginning of the illness prior naturally will be a shelter to the general public. This is attainable by sending propels in remote innovation to the current patient observing framework. This paper proposes the improvement of a module that gives versatility to the specialist and the patient, by embracing a straightforward and well known procedure, identifying the variations from the norm in the bio sign of the patient ahead of time and sending a SMS alarm to

the specialist through Global System for Mobile(GSM) in this way taking appropriate careful steps therefore decreasing the basic degree of the patient. Overall studies led by World Health Organization (WHO) have affirmed that the heart-related maladies are on the ascent. A large number of the heart related issues are credited to the advanced ways of life, nourishment propensities, corpulence, smoking, tobacco biting and absence of physical activities and so on. The post-employable patients can create intricacies once they are released from the emergency clinic. In certain patients, the cardiovascular issues may reoccur, when they begin accomplishing their normal work. Consequently the ECG of such patients should be observed for quite a while after their treatment. This aides in diagnosing the inappropriate working of the heart and play it safe. A portion of these lives can regularly be spared if intense consideration and heart medical procedure is given inside the alleged brilliant hour. In this way, the requirement for counsel on direct clinical consideration and advancement of good wellbeing by persistent observing and catch up gets unavoidable. Henceforth, patients who are in danger necessitate that their heart wellbeing to be checked every now and again whether they are inside or outside so crisis treatment is conceivable. Telemedicine is broadly viewed as a major aspect of the inescapable fate of the cutting edge practice of medication.

### 3.3 The real-time monitoring system for in-patient based on ZigBee

The framework is comprised of two sub-frameworks: tolerant physical states information securing and correspondence framework dependent on ZigBee innovation, and medical clinic checking and control focus. The patient physical states information securing and correspondence framework screens the primary physical parameters and development status constantly. The data from information obtaining framework is sent to medical clinic checking focus by ZigBee remote correspondence module. The checking focus gets the data from every patient and spare them to the database, and afterward passes judgment on the conditions of the patient by fluffy thinking. The information from the patient can be shown as a diagram or numeric on the screen in the event that it is fundamental, and afterward the specialist can analyze the patient as

indicated by the recorded constant information. Remote sensor arrangement is comprised of a ton of remote sensors dependent on ZigBee innovation. The ZigBee innovation gives a goal to transmitting sensors' information by remote correspondence.

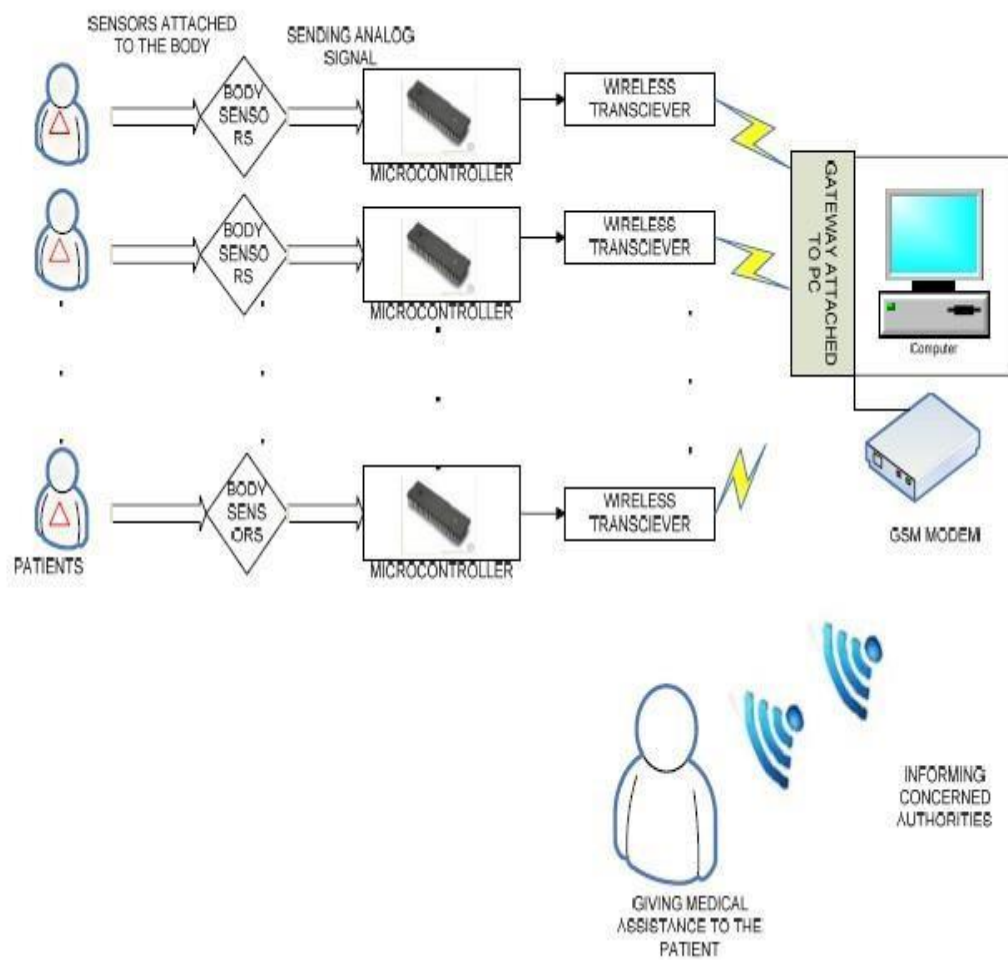
ZigBee innovation can transmit information with a pace of 250kbps, and afterward it is sufficient for the physical parameters of the patient. The correspondence separation of ZigBee hub can be more than 200 meters and can be spread by include course hub, and afterward ZigBee innovation is fit to a short separation remote sensors arrangement. ZigBee innovation claims numerous temperances, for example, low force utilization, minimal effort, little size, free recurrence, and so forth. To know the physical conditions of in-persistent, the physical parameters should be observed continuous. The conventional clinical test instrument is an enormous size and associated by wire regularly, and the patient is required to hush up during the test. In the vast majority of the emergency clinic, the clinical instruments should be perused by specialist or nurture, and the physical parameters are tried and recorded a couple of times every day, the ongoing checking is costly for the greater part of the patients, and can be just acquirable for ICU by a medical attendant. Consequently, the compounding of patient can't be found in time, and afterward the patient would not benefit from outside intervention in time. For the greater part of the patients can be checked constant in clinic, we should locate another technique

## Chapter 4 - Existing System

In the current framework, we utilize dynamic system innovation to organize different sensors to a solitary PMS. Patients' different basic parameters are constantly observed by means of single PMS and answered to the Doctors or Nurses in participation for convenient reaction in the event of basic circumstances. The sensors are joined to the body of the patients without making any inconvenience them. In this PMS we screen the significant physical parameters like internal heat level, ECG, heart beat rate and circulatory strain utilizing the sensors which are promptly accessible. In this manner, the simple qualities that are detected by the various sensors are then given to a microcontroller appended to it. The microcontroller forms these simple sign estimations of wellbeing parameters independently and changes over it to computerized esteems utilizing ADC converter.

Presently, the digitalized qualities from more than one microcontroller are sent to the Central PMS. Every one of the sensors joined microcontroller with a handset will go about as a module which has its own one of a kind ID. Every module transmits the information remotely to the entryway appended to the PC of the Central PMS. The passage is joined to the PC for example Focal PMS which is arranged in the clinical focus, is fit for choosing distinctive patient IDs and permitting the door to get diverse physical parameter esteems the patient indicated by the ID. The product structured utilizing Graphical User Interface (GUI) can work on various physical parameters of every patient, successively with a predetermined time interim for every patient.

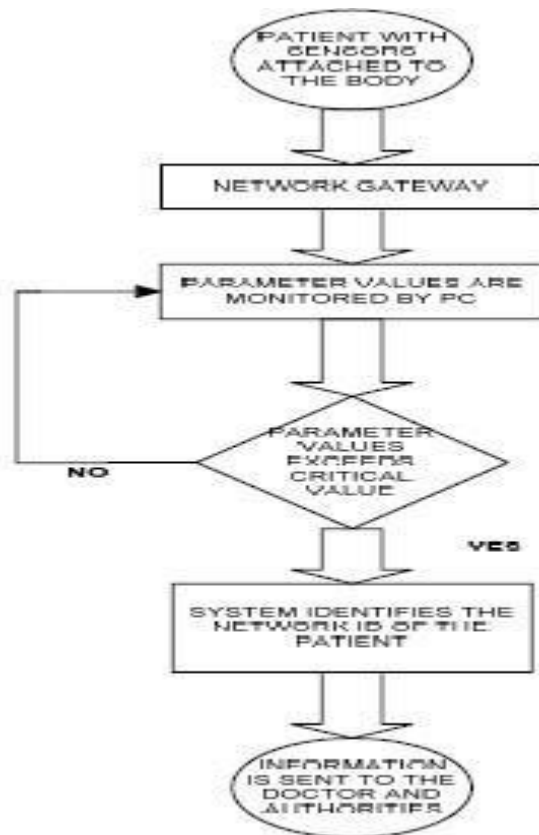
Whenever, any of the specialists or attendants can sign on the Central PMS and check the historical backdrop of the watched basic parameters of any of the patient appended to the system.



**Figure 4.1:** Existing System



In case of a critical situation which requires the immediate attention of the doctors or nurses for any of the patients, the custom software will instruct the Central PMS to enable the GSM modem to send an SMS with the patient ID. A voice call is also made to the doctors and the staffs of the hospital. The SMS also consists of a status of the patient's physical condition. With the help of the patient ID, the doctor can easily identify and attend to the patient situation.



**Figure 4.2:** Flow chart of Existing System

## Chapter 5 – Proposed System

The fundamental target is to structure a Patient Monitoring System with two-way correspondence , for example not just the patient's information will be sent to the specialist through SMS and email on crises, yet in addition the specialist can send expected proposals to the patient or gatekeepers through SMS or Call or Emails. What's more, Patient or gatekeeper can ready to follow patient's area anytime through Google Maps which would empower to send clinical administrations in the event of a crisis for non-out of commission patients.

Using the proposed system, data can be sent wirelessly, allowing continuous monitoring of the patient. Contributing accuracy in measurements and providing security in proper alert mechanism give this system a higher level of customer satisfaction and low-cost implementation in hospitals. Remote health monitoring can provide useful physiological information in the home. This monitoring is useful for elderly or chronically ill patients who would like to avoid a long hospital stay. Wireless sensors are used to collect and transmit signals of interest and a processor is programmed to receive and automatically analyze the sensor signals. Using a single parameter monitoring system an approach to a remote health monitoring system was designed that extends healthcare from the traditional clinic or hospital setting to the patient's home. The system was to collect a heartbeat detection system data and temperature data parameters. The data from the single parameter monitoring systems was then availed for remote detection.

The temperature sensor and pulse rate sensor will measure the health condition of the patient in real time and pass the values to the arduino.

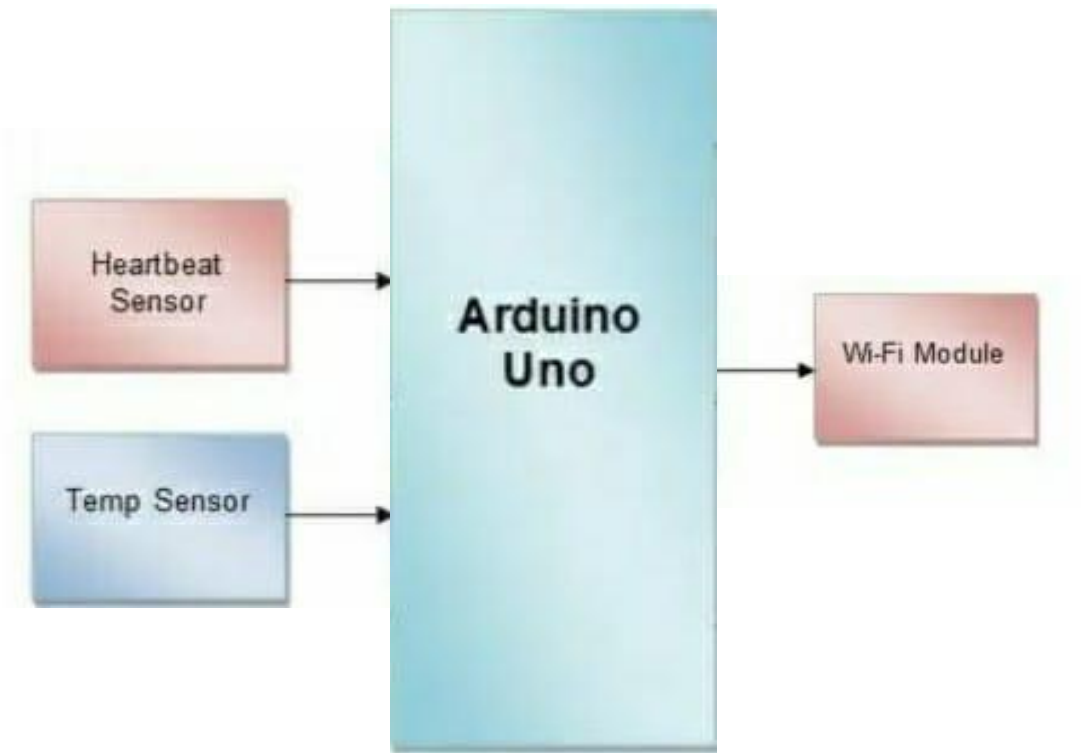
With the help of arduino and esp 8266 module we will record the data and upload it to the internet.

The data will be recorded on a regular basis and when it exceeds a threshold value the respective individuals are notified.

[ThingSpeak](#) provides very good tool for [IoT based projects](#). By using ThingSpeak site, we can monitor our data and control our system over the Internet, using the Channels and webpages provided by ThingSpeak. ThingSpeak 'Collects' the data from the sensors, 'Analyze and Visualize' the data and 'Acts' by triggering a reaction. We will use ThingSpeak to monitor patient heartbeat and temperature online using internet. We will also use IFTTT platform to connect ThingSpeak to email/message service so that alert message can be sent whenever the patient is in critical state.

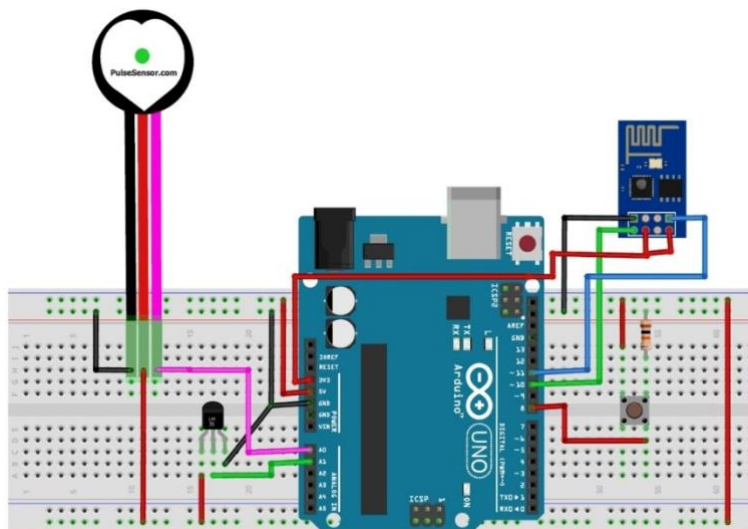
IFTT- If This Then That is a web service that creates chains of simple conditional statements

## 5.1 Block Diagram



*Figure 5.1: Block Diagram of the proposed system*

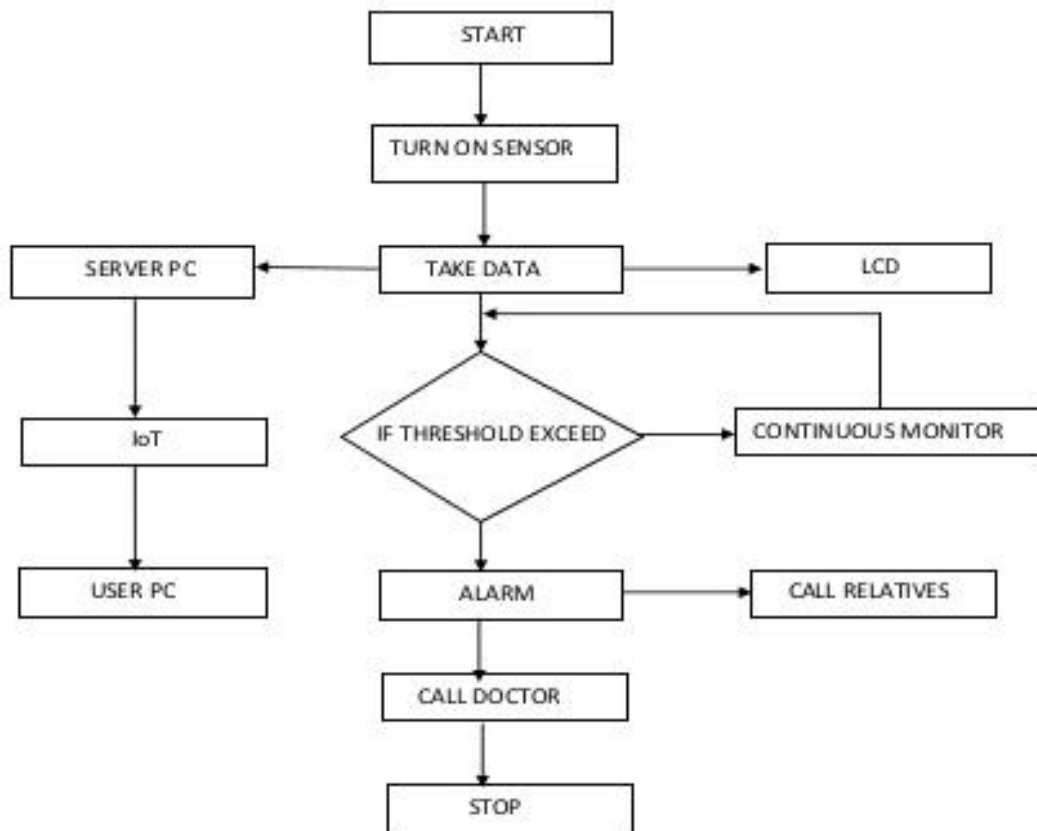
## 5.2-Circuit diagram



*Figure 5.2: Circuit Diagram of the proposed system*

## 5.3 – Flowchart

# FLOWCHART



**Figure 5.3:** flowchart of the proposed system

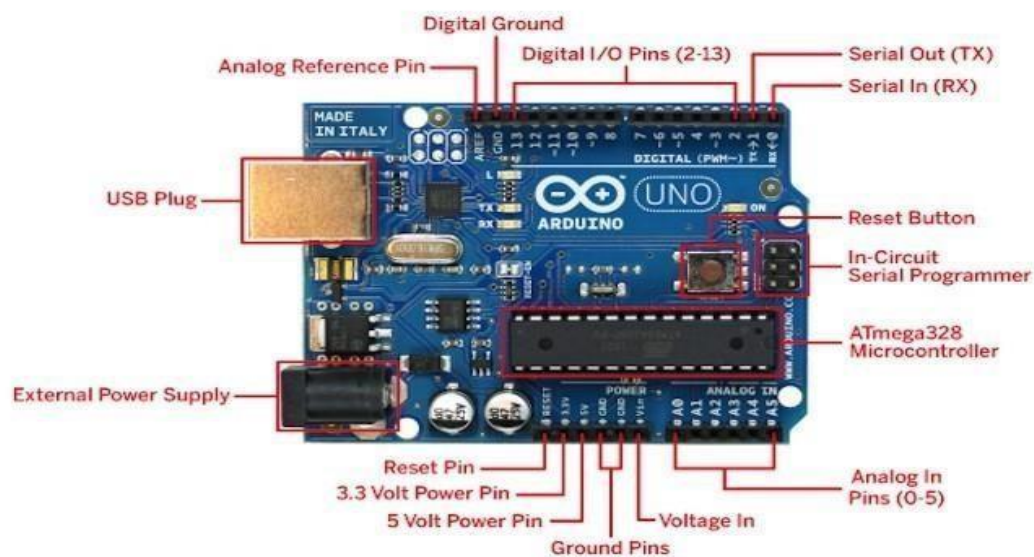
## Chapter 6 – Hardware and software specifications

### 6.1- Hardware specifications:

1. Arduino Uno Micro Controller
2. LM35 Temperature sensor
3. ESP 8266 Wi-fi module

#### 6.1.1 Arduino Uno Micro controller

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.



**Figure 6.1:** Arduino Board

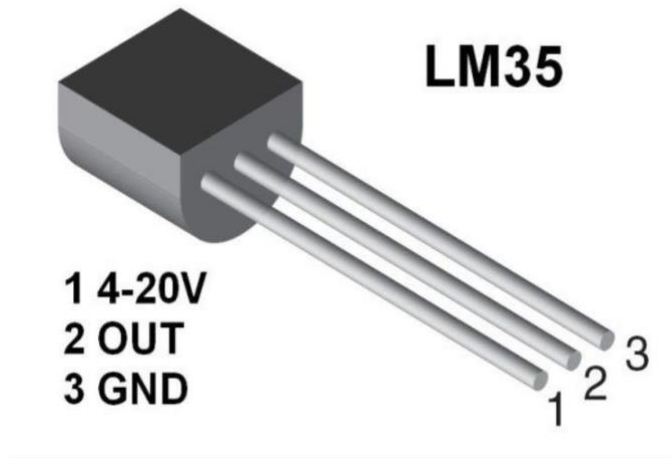
Starting clockwise from the top center:

1. Analog Reference pin
2. Digital Ground

3. Digital Pins 2-13
4. Digital Pins 0-1/Serial In/Out - TX/RX (dark green) - These pins cannot be used for digital i/o (digitalRead and digitalWrite) if you are also using serial communication (e.g. Serial.begin).
5. Reset Button - S1
6. In-circuit Serial Programmer
7. Analog In Pins 0-5
8. Power and Ground Pins
9. External Power Supply In (9-12VDC) - X1
10. Toggles External Power and USB Power (place jumper on two pins closest to desired supply) - SV1
11. USB (used for uploading sketches to the board and for serial communication between the board and the computer; can be used to power the board)

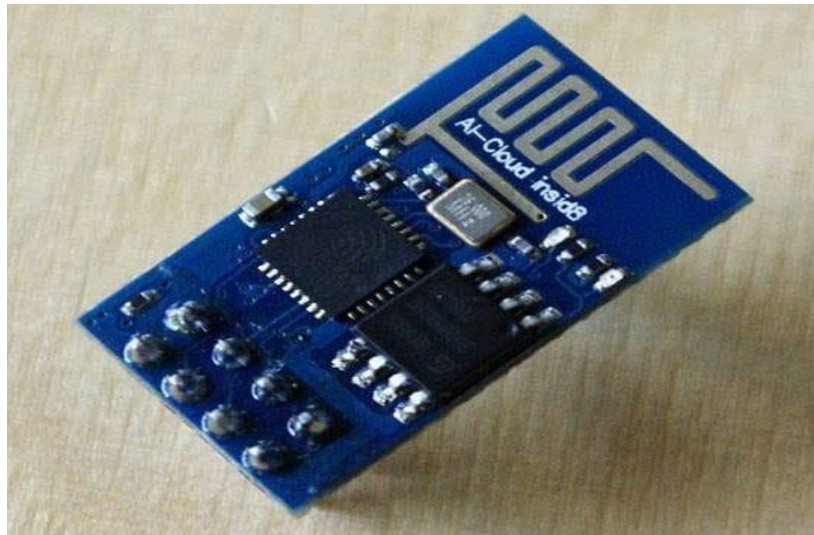
### 6.1.2 LM35 Temperature Sensor

Temperature sensor is a device which is designed specifically to measure the hotness or coldness of an object. LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C). With LM35, the temperature can be measured more accurately than with a thermistor. It also possesses low self-heating and does not cause more than 0.1 °C temperature rise in still air. The operating temperature range is from -55°C to 150°C. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.



*Figure 6.2: Temperature Sensor*

### 6.1.3 ESP 8266 Wi-fi module



*Figure 6.3: ESP 8266*

Most people call ESP8266 as a WIFI module, but it is actually a microcontroller. ESP8266 is the name of the microcontroller developed by Espressif Systems which is a company based out of shanghai. This microcontroller has the ability to perform WIFI related activities hence **it is widely used as a WIFI module**. we will use AT commands to send data from Arduino to ESP.

### 6.2-SOFTWARE REQUIREMENT:

ARDUINO IDE- An integrated development environment designed for Arduino based projects.

## **Chapter 7 – Results and discussion:**

The ambition of the project was to plan a system which could gather reading of various important indications of the patient and after that evaluate at cloud then caution the doctor or concerned individuals about the health condition.

These reading are chronicled and can be obtained by either the web interface to give a pictorial representation of information or by the information analysis module to decide the seriousness of the patient.

The program is written in the IDE .The program is the compiled using the verify option. After verifying and when there are no errors the program is uploaded to the arduino using the upload option next to the verify option provided the arduino is connected to the system using USB.

When the IDE shows the programming is done it is possible to view the real time output in the arduino.

The following are the expected results:

- i. Serial monitor displayed the data collected from sensors.
- ii. Serial monitor displayed the IP address of the LAN.
- iii. with the help of thingspeak the data is sent over the internet and stored in the cloud .
- iv. Using IFTTT an email is triggered when the data exceeds the threshold value .



## Chapter 8 –Advantages and applications

All-around technological enhancement. Rendering hospital visits unnecessary, passively accumulating and deeply analyzing important health data, etc. We've already pondered on all these advanced tech capacities galore enough. The IoT provides space for fantastic long-term innovations.

Cost savings. One of the greatest advantages of IoT in healthcare is that efficient autonomous systems will cost less to manage and 'employ' in the long run. Things are even better when it comes to patient cost savings due to fewer hospital journeys as well as accelerated diagnostics and treatment.

Accessibility. Doctors can view all the necessary data on command and check real-time patient conditions without leaving their office.

This system is very effective in monitoring the person's health continuously because it is fully automated. It can be tested very easily with any person. This system is a good example of remote health monitoring. The compact sensors with IoT will make a huge impact on every patient's life, that even though they are away from home and physician, this helps them to reduce the fear of danger. Also, the challenges in sensing, analytics and prediction of the disease are also highlighted and those can be addressed to provide a seamless integration into the medical fields.

We can add a GPS module in IOT patient monitoring using Arduino Uno and WiFi module project. This GPS module will find out the position or the location of the patient using the longitude and latitude received. Then it will send this location to the cloud that is the IOT using the Wi-Fi module. Then doctors can find out the position of the patient in case they have to take some preventive action.

## Chapter 9 – Conclusion And Future Scope

### 9.1 Conclusion

The fundamental target of the investigation was effectively accomplished. All the individual modules like Heartbeat identification module, fall discovery module and so forth and remote review module gave out the proposed outcomes. The structured framework modules can additionally be enhanced and created to a last single circuit. Increasingly significant actuality that surfaced during venture configuration is that all the circuit segments utilized in the remote wellbeing discovery framework are accessible without any problem. With the advancement in the coordinated circuit industry, Micro Electro Mechanical Systems (MEMs) and microcontrollers have gotten reasonable, have sped up, scaled down and force productive. This has prompted expanded advancement of inserted frameworks that the human services masters are receiving. These inserted frameworks have likewise been received in the Smartphone innovation. Also, with expanded web entrance in most creating nations through cell phones, and with utilization of Internet of things (IoT) will get received at a quicker rate. The Remote Health Care framework uses these ideas to think of a framework for better personal satisfaction for individuals in the public eye.

From a designing point of view, the venture has seen ideas procured through the software engineering and inserted study period being essentially applied. The Electric circuit examination information was utilized during plan and manufacture of the individual modules. Electromagnetic fields examination utilized in the remote transmission among microcontrollers and Software programming utilized during programming of the microcontrollers to think of a last completed circuit framework.

### 9.2 Future Scope

#### a) Physiological information assortment

1. Home Ultrasound
2. Brain sign checking

#### b) Remote survey of information

1. Issues related with having information on the web. Handle Distributed forswearing of administration. DDOS, and Data protection/security particularly of clinical frameworks.

c) IoT based Remote Patient Monitoring System can be improved to recognize and gather information of a few oddities for observing reason, for example, home ultrasound, Brain signal checking, Tumor discovery and so on.

d) More inquire about on issues related with having information on the web, information security as IoT is overseen and run by different advances and various merchants are associated with it. Security calculations and certain safety measures by the clients will help stay away from any security related dangers in IoT organize.

e) The interface can be intended to control which sensors can be utilized by customers as per their necessities.

f) Web UI can be improved to play out a few exercises which incorporate controlling the equipment, ongoing diagrams, history and investigation charts to watch abnormalities and so forth.

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