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Iot Based Tri-Smart Health Monitoring And Tracking System

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Abstract
abstract Everyone want to be in good health. It is also critical to regularly monitor a person's health in order to avoid any unexpected changes in the future. Furthermore, simple Monitoring the health state of the elderly is also vital, and Long hospital lines and ambulatory care are unheard of in today's fast-paced environment. Monitoring is generally understood. These concerns necessitate that the system create a rudimentary health monitoring system for use in houses or, if possible, with main health parameters We are aware that The advancement of technology has resulted in a plethora of wireless gadgets and The internet of things We can collect and transfer data via IoT. Nowadays, IoT plays an important role in data capture and monitoring, data analysis, recording, storage, and presentation. In this project, we will evaluate factors such as body temperature, blood pressure, pulse sensor, and GPS to monitor the patient's present position and in addition to GPS, a GSM system is used to convey notifications. We utilize an Arduino Board as a processor, where the collected data is transferred and subsequently analyzed. The WIFI module is used to transfer data over the internet for analysis. This analyzed data is saved and utilized for a variety of purposes. When a serious situation is recognized, the results are instantly communicated to the doctor. This smart IoT work can help to increase the extra care towards patient. Governments may attempt to use these platforms and information for long-term surveillance to manage and monitor people's conduct.

Keywords:*Blood pressure, pulse sensor,ECG, GSM and IoT.*

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I. INTRODUCTION

We know that healthy individuals are the most valuable asset to any country, improving human health and providing access to cheap, high-quality health care is a top priority for all governments. When people are healthy, their well-being increases. An IoT system for healthcare is often composed of a number of sensors that are linked to a server and allow real-time monitoring of a persons. Human body parameters such as temperature [1], heartbeat and blood oxygen saturation (SpO2) measurement is sensed using max 30105 and along with this ECG signal of patient is acquired with help of patches [2]. All these information is sent to Arduino controller. With the help of IoT Patient health can be monitored from remote location [4]. GSM and GPS modules are used to send SMS alert in case of patient is sick [3]. We can access patient health information via 1) an LCD display, 2) the cloud, and 3) GSM, which we can call it as tri-monitoring. This tri-monitoring can be utilized for military purposes as well as those who living in distant places to decrease hospitalization. The patient parameters may be accessed from anywhere in the world utilizing this IoT. As a result, the cost of medical expenses will be lowered

Because there is no treatment and no effective isolation, the covid virus has spread rapidly around the world. There is also no good knowledge about this virus during the time of covid. Many people, including physicians, nurses, police officers, housekeeping and pharmaceutical workers, and ordinary citizens, have been severely harmed as a result of this covid virus. Because there is no intermediary between the injured patient and the doctor, we have lost many doctors. If we had this method at the time, we could easily endure a large number of lives. All of these devices have been delivered to all of the families, and as the body parameters like as temperature, oxygen level, and heart rate alter, they can remotely assess their health state using ECG and prescribe the best medicine to patients. If the situation is urgent, they may advise you to go to the hospital. We can block 60% of viruses when there is no haste or physical touch with other individuals. Even now, the game is not finished. Many individuals have been suffering from black virus and other difficulties such as respiratory problems, irregular heartbeats, and complaints such as rapid energy drain. In order to solve these problems, we must maintain this equipment. So we can see that even after a pandemic, we need to take care of our health by getting regular examinations, and many diseases may be diagnosed using these three factors. Not only that, but if any other sickness occurs, doctors can readily detect the change in the patient's body and begin treatment as soon as feasible. This increases the safety of patient health while also reducing disease-related harm.

II. BLOCK DIAGRAM

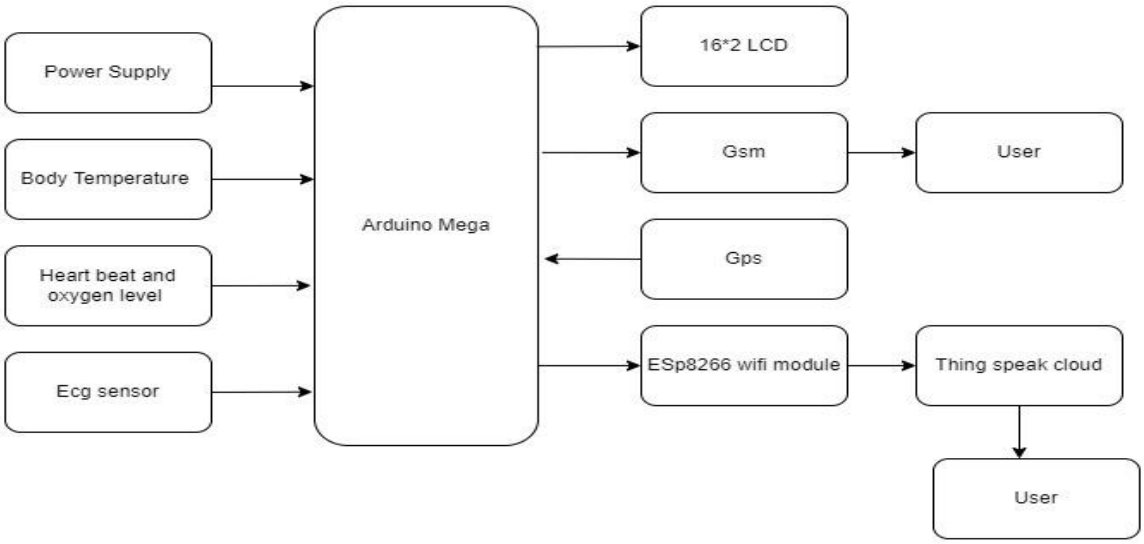

Figure 1: Block Diagram

This project is made up of numerous components that are utilized for specialized applications. It is made up of two separate sensors: the MAX30105 sensor for monitoring body temperature, oxygen saturation, and heartbeat measurement, and the ECG sensor for measuring heart rhythm activity. The Arduino Mega controller collects data from various sensors. The GPS module is utilized to determine the patient's actual position. The controller is provided the patient's position as input. The Arduino controller sends data to the ESP8266 module, which is linked to the cloud, allowing the patient's health to be tracked from a distance. The 16*2 LCD display is used to monitor the parameters in real time so that the doctor can check the patient's health. The GSM module is used to transmit alert messages to the doctor and the patient's guardian. All of these messages may be sent using the Arduino controller.

III. METHODOLOGY

MAX30105 sensor will sends the body temperature, oxygen saturation, and heartbeat to the Arduino controller. Arduino controller will process the information received from sensor and checks if the temperature, oxygen saturation (SPO2), and heartbeat of the patient is high or low. If the patient health is not good, then SMS alert will have sent to doctor and guardian. This SMS consists of health parameters and location of patient. There is another sensor used to measure the ECG of patient which tells the heart condition of patient. If the patient heart condition is not well then also the SMS alert which is having the location of patient will be sent to doctor and guardian. There is 16*2 LCD display which is used to display the health conditions of the patient so that doctor can see the patient health at live. Arduino controller will send all the parameters of patient to ESP8266 module which is used to transmit all the data to cloud so that it can be used monitor in remote location using internet.

To monitor patient health parameters thingspeak platform is used to monitor at remote location using internet anywhere in the world. Arduino controller will continuously process the information received from sensors and checks the patient health condition and takes appropriate action to save the patient. With the help of this device patient health can be monitored even if he is not hospitalized, also patient can save the expenses of hospital rent, patient can do his work. Patient always not needed to consult the doctor and patient will consult the doctor only if needed in this way patient and doctor can save their time. Using IoT and GSM gives the high safety for the patient when doctor is not monitoring also when patient is sick doctor will receive alert message so that he can give treatment to patient.

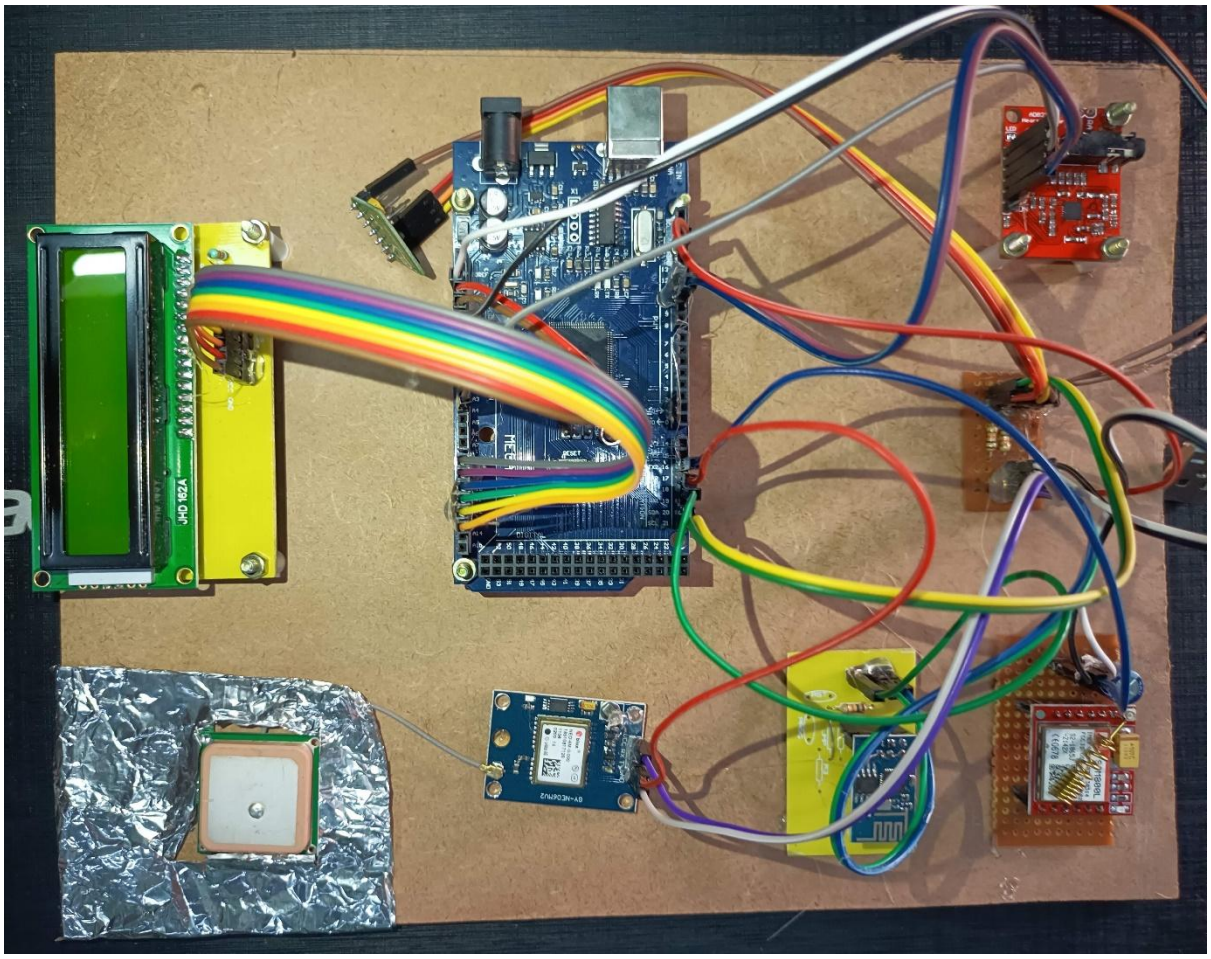

Fig.2: Circuit Diagram

III Components

3.1 Max30105

Max30105 shown in Fig.3 supply voltage range is in between 1.7 to 2.0 volt and Rated current supply of 600µA and resolution of 8-bit ADC. Operating temperature range is in between -40 to 85 degree Celsius. It is used to monitor heart rate, pulse oximeter and body temperature since this device operates at 1.7 to 2.0 volts it consumes ultra-low power. It can give high accurate data because it works at high sample rates and also has ability to give output fast. These are used in mobile phones and wearable devices like fitness assistant devices. It is integrated to sense both oxygen levels and also heart rate. It is low noise electronic device with SNR 89. This device includes LED's, low noise circuits, Photo diodes optical elements. Communication standard of this device is I2C.

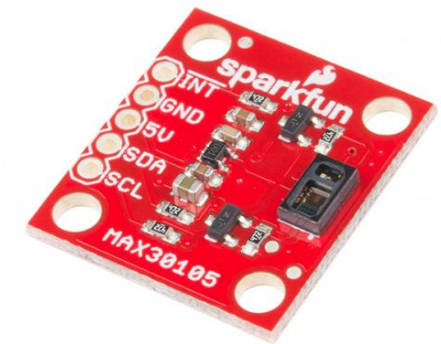

Fig.3: MAX30105

3.2 ECG sensor(AD8232)

ECG sensor shown in shown in Fig.4. Heart disease has been a major concern in these days, and many individuals have died as a result of various health issues. As a result, heart problems should not be regarded ignored. This illness can be avoided by studying or monitoring the ECG signal early on. As a result, we propose ECG Monitoring using AD8232 ECG Sensor & Arduino with ECG Graph. AD8232 is a compact size chip is compact it is interfaces with Arduino Mega controller and Arduino software is used to monitor the ECG signal using serial plotter this sensor consists of operational amplifier circuits and ground 3.3 v pin out-pin, Lo- and Lo+. Features of this device are input rated power supply ranges from 2 to 3.5V and 3.5 V an 170 µA. common mode reduction ratio is 80dB. Thus, the AD8232 ECG sensor is a precise tiny chip used for sensing the electrical movement of the heart, which may be plotted like an electrocardiogram (ECG). It is used to aid in the diagnosis of a number of cardiac problems.

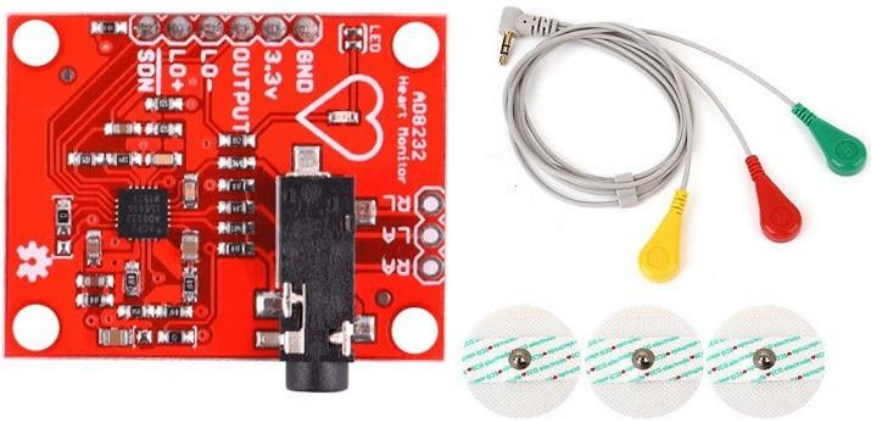

Fig.4: ECG sensor(AD8232)

3.3 Arduino Mega

Arduino Mega Controller shown in Fig.5. This controller is built around the ATmega2560 microcontroller. There are 54 digital input output pins and 16 analogue input pins on this controller. It also has four UART serial ports, a crystal oscillator with a frequency of 16 MHz, a power jack, a USB connection, and a reset button. The working voltage of this controller is 5V, the rated input voltage is 7-12V, and the DC current per I/O pin is 20Ma. The 3.3V pin's DC current is 50Ma. It has 256 KB of flash memory as well as 8KB of boot loader memory. This device's SRAM is 8KB. And EEPROM is 4KB in size. It has 101.52*53.3mm dimensions and weighs 37 grams.

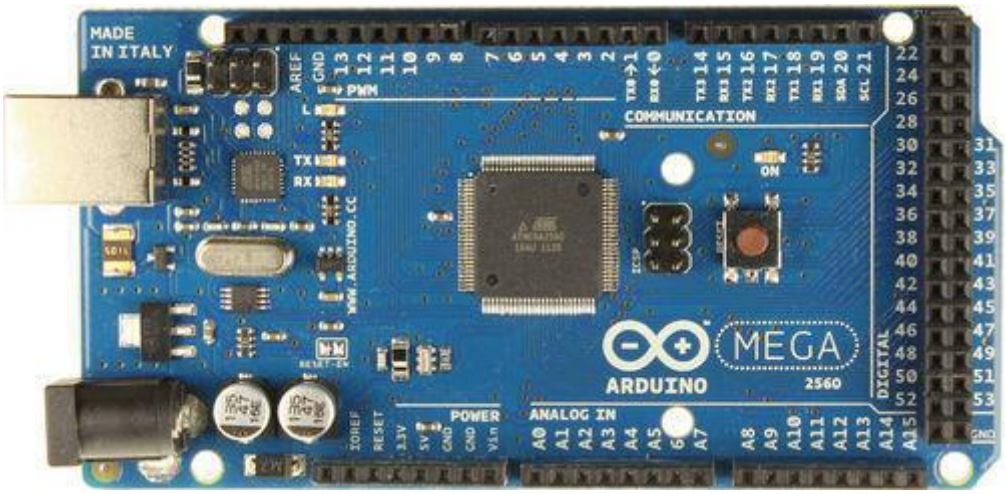

Fig.5: Arduino Mega 2560

3.4 GPS-6M GPS Module

GPS module shown in Fig.6. It is used to give the ability to sense the location it consumes low power affordable and easy to interface. This module uses NEO-6M chip. It is having power saving mode that allows the reduction in power consumption. With the power saving mode, it can save power consumption to just 11Milliampere. this module supports the baud rate of 4800bps to 230400bps with default 9600. Horizontal

position accuracy is 2.5 meters, navigation update rate is 1HZ with sensitivity of -161dBm, the communication protocol used supported by this device is NMEA, UBX and RTCM. Operating temperature of this device is -40 to85 degree Celsius, operating voltage and current is 2.7 to 3.6V and 45 Milliampere current. It is having an LED if it is not blinking then it means searching for satellite and if it is blinking for every 1 second means position is found. It also has Battery which is rechargeable and acts as a super capacitor and EEPROM memory of 4KB is linked to the NEO-6M chip via I2C. It consists of 4 pins ground, TxD, RxD and VCC pin

Fig.6: GPS-6M GPS Module

3.5 GSM-SIM800L

GSM module Shown in Fig.7. SIM800L is a tiny cellular module that supports GPRS transfer and SMS transmission. Low cost, compact size, and support for quad band frequencies. This module has 2 antennas are there. It is good for narrow areas. Operating voltage and current is 3.8 to 4.2 volts and 350 Milliampere current and operating temperature is in between 3.8V – 4.2V. thus device supports quad band that is 850, 950, 1800, 1900. This is having 6 pins NET, VCC, RESET, RxD, TxD and ground pins. After connecting power, the module powers up, looks for a cellular network, and automatically logs in. An on-board LED indicates the status of the connection (no network coverage - fast blinking, logged in - slow blinking).

Fig.7: GSM-SIM800L

3.6 Wi-Fi module ESP8266:

Wi-Fi module ESP8266 shown in Fig.8. Espressif Systems' system on a chip (SOC) Wi-Fi microchip for Internet of Things (IoT) applications. The ESP8266 is currently widely utilized in IoT devices because to its inexpensive cost, compact size, and compatibility with embedded devices. Although the ESP8266 has been superseded by the newer generation ESP32 microcontroller chip, it remains a popular choice for IoT developers and manufacturers. In this post, we'll go over the key characteristics of ESP8266 modules and development boards, as well as how they may be used in the realm of IoT. The ESP8266 module links microcontrollers to Wi-Fi at 2.4 GHz. It may be used in conjunction with ESP-AT firmware to enable Wi-Fi connectivity to external host MCUs, or as a self-contained MCU by running an RTOS-based SDK.

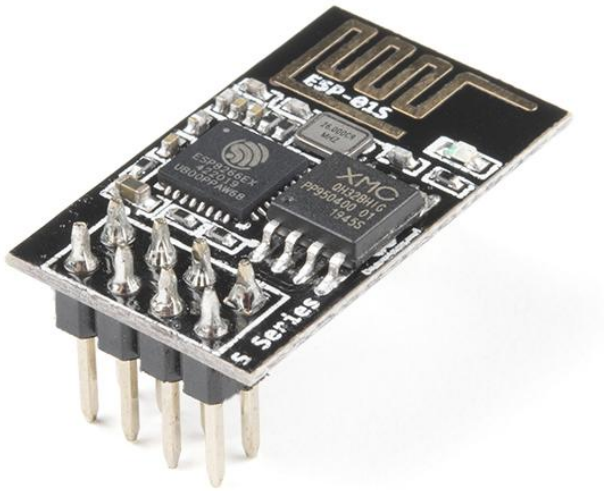

Fig.8: Wi-Fi module ESP8266

3.7 16x2 LCD Display Module

LCD display shown in Fig.9. The term 162 LCD comes from the fact that it has 16 columns and 2 rows. There will be 16 pins on the CD display. LCDs (Liquid Crystal Displays) are utilised in embedded system applications to show different system characteristics and status. The LCD 16x2 is a 16-pin device with two rows of 16 characters each.LCD 16x2 may be utilised in either 4-bit or 8-bit mode. It is also possible to make your own characters. It features eight data lines and three control lines that may be utilised for control. Refer to the LCD 16x2 module subject in the sensors and modules section for further information on how to utilise it. A plane panel display is used in LCD displays. Operating voltage ranges from 4.7 to 5.3 volts and 1. Bezel size of display is 72*25mm. operating current is 1Milliampere without backlit. Supporting characters up to 32 and it works in 4 bit and 8 bit modes. There is 2 registers in this display command and data register.

Fig.9 : LCD Display

IV Results

ECG, body temperature, oxygen levels, heart rate has been monitored in IoT, LCD display and SMS has been sent through GSM module. The screenshots of message received when patient is sick shown in Fig 8 GSM message. Wi-Fi module the patient health parameter has sent to cloud and it also observed that these parameters through mobile with internet connection in remote location shown in Fig: 8.ECGs can be examined by looking at waveform elements. These waveforms represent electrical activity in the heart. The P wave is the first rising wave on the ECG trace. That means the atrium is contracting. The Q wave, a modest downward deflection, is followed by R, a bigger upward deflection, a peak, and finally, a downward S wave. This QRS complex shows contraction and depolarization of the ventricles. The T wave, which often has a smaller upward waveform and represents ventricular re-polarization, comes last. Shown in Figure 8. By using IoT latitude and longitude of the patient will be sensed and updating in cloud and also observed that temperature, heartbeat of the body is getting updated in cloud helping doctor to see health conditions of the patient shown in fig (10), also oxygen levels updating screen as shown in fig (11) and oxygen levels screen shown in Fig.12.

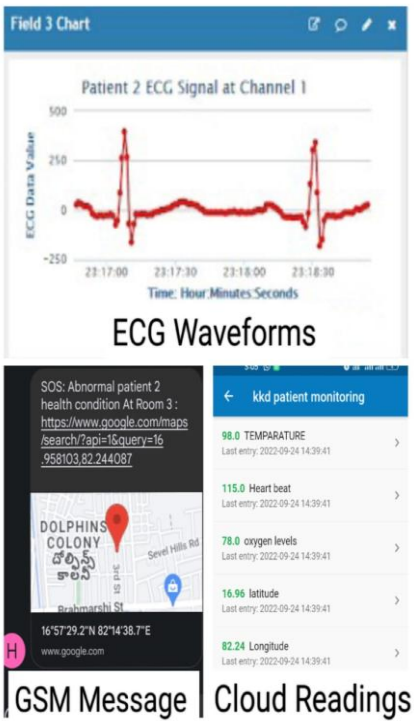

Fig.10: ECG, Messages, and Cloud Reading

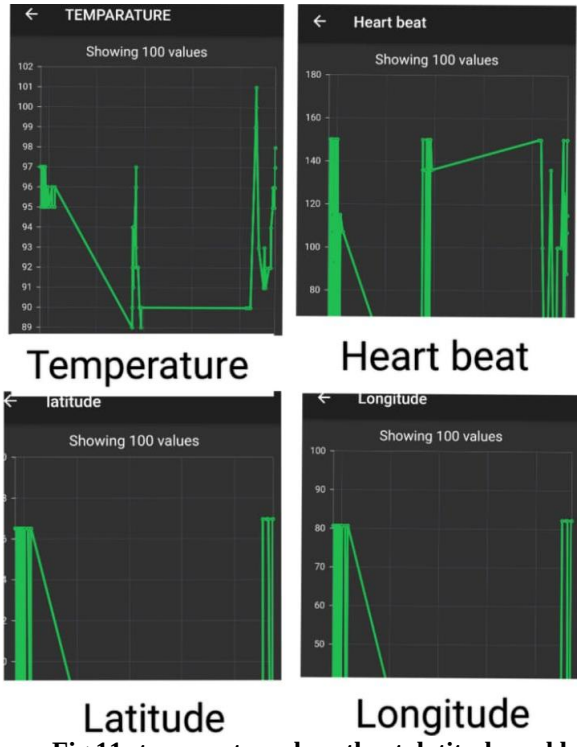

Fig.11: temperature, heartbeat, latitude and longitude

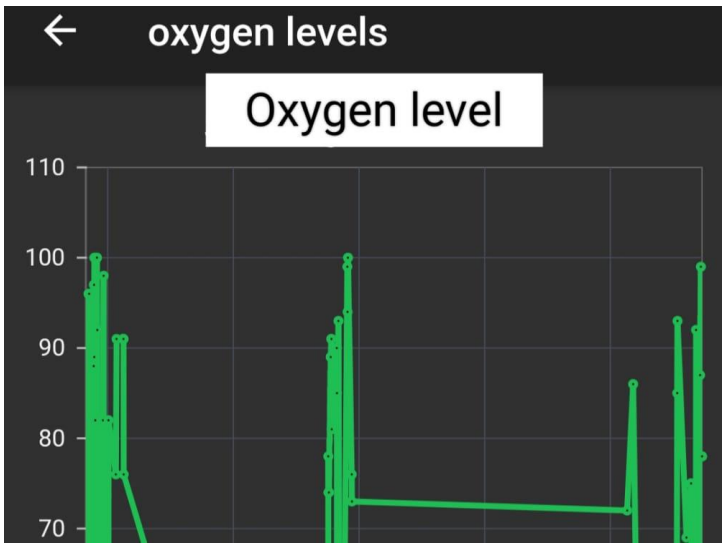

Fig 12: Oxygen level

IV. CONCLUSION

It is observed that if patient body temperature or heart rate or oxygen levels of patient fall below or above limits that we set then automatically SMS has been sent to doctor as well as patient family members. By using this type of devices we can save many lives by improving quality and standards of health care systems. By having this type of systems we can handle pandemic situations easily.

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