

## E PATIENT MONITORING SYSTEM USING ARDUINO

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### ABSTRACT

The IoT-based completely affected character health monitoring device is a regular progressive term given to any clinical machine that has internet capability and may diploma one or extra healthcare records of a affected character who is related to the device together with heartbeat, body temperature, humidity, blood pressure, ECG, steps, etc. The machine can record, or transmit and alert the medical doctor if there may be an abrupt exchange withinside the affected character's health. The IoT-based completely health monitoring device is used in which the affected character and medical doctor for related health experts are at one in every of a type locations. For example, a affected character can stay at a one in every of a type location and preserve his or her routine existence and a medical doctor can show the affected character's health. Based on the received records from the affected character health expert can prescribe the fantastic treatment or take straight away motion in case of an emergency. In this project, we have got were given related temperature sensor, heartbeat sensor, ECG sensor, and air fantastic sensors to Arduino and with the help of the ESP8266 Wi-Fi, the module sends the records to Thing speak Internet of things platform. If there may be an abrupt exchange withinside the affected character's health, an SMS alert may be sent to the family member and attending medical doctor.

**Keywords:** Arduino Uno, Sensors, GSM Module, Wi-Fi Module, I2C Module.

### I. INTRODUCTION

Today change in the environment increasingly growing number of people with chronic diseases, this is due to different risk factors such as dietary habits, physical inactivity, alcohol consumption, viral attacks, etc. Due to the lack of a perfect health monitoring system, patients suffer from serious health issues. Like the recent coronavirus attack that has ruined the economy of the whole world to an extent is an example of how health care has become of major importance. In such areas where the infection is spread, it is always a better idea to monitor these patients using remote health monitoring technology. So the Internet of Things (IoT) based health monitoring system is the best current solution for it. Remote Patient Monitoring System arranges the empowers observation of patients outside of customary clinical settings (e.g. at home), which extend access to human services offices to bring down expenses. The important objective of that project is the design and implementation of a smart patient health tracking system that uses Sensors to track patient health and uses IoT to inform their loved ones and attending doctors in case of any issues. The coming of the Internet of Things (IoT) technologies facilitates the progress of Patient healthcare and minimizes the big issue from face-to-face consulting to telemedicine. This project facilitates health expertise to continuously monitor the health condition of the patient. This proposed system will improve the current healthcare system that may protect lots of lives from death.

### II. LITERATURE REVIEW

#### 2.1 Review: 1

##### An IoT basis Patient Health Monitoring System (June 2018)

D.Shiva Rama Krishnan, Subhash Chand Gupta, Tanupriya Choudhury

This tool proposed a Temperature and heartbeat sensor for tracking patient's health. Two sensors are related to the Arduino-Uno. The records from sensors is non-prevent to the IoT platform the use of a wireless network. In case of any fast changes in patient's coronary coronary heart rate or body, a temperature alert is sent to their loved ones.

**2.2 Review: 2**

**IOT BASED HEALTH MONITORING SYSTEM (2020)**

Prajoona Valsalan<sup>1</sup>, Tariq Ahmed BarhamBaomar, Ali Husain Omar Baabood

This tool is monitored via the body temperature of the patient, pulse rate, and room humidity and temperature the use of sensors. To diploma this sensor values are then sent to a systematic server the use of wireless communication. These records are then received in an actual personals mobileular telecelll smartphone with an IoT platform. With the values received the medical medical doctor then diagnoses the infection and the u . s . a . of health of the patient.

**2.3 Review: 3**

**Patient Monitoring System Basis Internet of Things (2016)**

JorgeGómez, ByronOviedo, EmilioZhuma

This paper to monitoring the health and workout recurring steering to patients with continual diseases. A case take a look at for patients with diabetes and coronary coronary coronary coronary heart arrhythmia is confirmed in this paper.

**2.4 Review: 4**

**Arduino UNO and GSM basis wireless health monitoring tool for patients (2017)**

Pratiksha W. Digarse; Sanjaykumar L. Patil

This paper proposed a health monitoring tool that measures coronary heart rate, body temperature, and saline liquid diploma for a patient. This tool continuously sends SMS to the medical medical doctor the use of GSM. If any sensor rate goes beyond the threshold, an alert message is sent to the medical medical doctor.

**2.5 Review: 5**

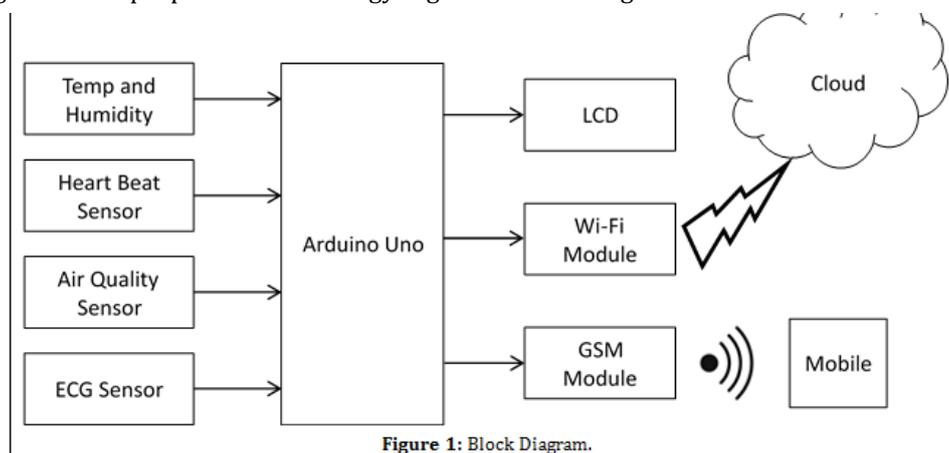
**An IoT basis human health issuer tool the use of Arduino Uno board (2017)**

S. Jayapradha, P. M. Durai Raj Vincent

This paper's authors addressed the severa uses of IoT withinside the healthcare tool and moreover described the demanding conditions faced via IoT in healthcare. Security is the number one interest for the use of IoT. Sensors like ECG sensor, BP sensor, mems sensor, and Eyeblink sensor are used to accumulate records. RFID-enabled identity gambling playing gambling playing cards are used to authenticate the Doctor or traveler to the cloud on which patient's records is stored.

**III.METHODOLOGY**

The Block diagram of the proposed methodology is given below in Figure 1.



**a. Arduino Uno**

The Arduino UNO is primarily based totally absolutely absolutely at the Microchip ATMEGA328P is the microcontroller. The Arduino UNO is the principle controller of our affected person tracking machine. This

Arduino UNO has 14 virtual enter or output pins, of which 6 may be used as PWM outputs. In this proposed machine we interfaced the enter pins of Arduino UNO with RFID, GPS, Push Button, and the output pins of Arduino UNO with GSM, Node MCU, Speaker, and LCD



Figure 2: Arduino Uno

**b. GSM (Global System for Mobile communication)**

Global System for Mobile conversation is a virtual cell device used for the conversation of cell devices. It is an global trendy for cell that is typically used for long-distance conversation. There is a diverse international device for cell conversation modules to be had withinside the marketplace like SIM900, SIM700, SIM800, SIM808, SIM5320, etc. This device used the SIM900A module which permits customers to ship or get hold of statistics over GPRS, ship/get hold of SMS. The GSM module makes use of USART conversation to speak with the microcontroller or PC terminal. AT instructions are used to carry out diverse capabilities like calling, posting statistics to a site, etc. In this device, we used GSM SIM900A Module to ship the notification of kids concerning their arrival at the bus to parents.



Figure 3: GSM Module

**c. ESP8266 Wi-Fi Module**

Wi-Fi modules provide an clean hassle-loose and speedy, answer for growing Internet of Things devices. Take the functionality of Wireless conversation over the strong and steady IEEE 802.eleven b/g/n widespread while not having to abscess the TCP/IP stack as those are constructed into the module and equipped to make use of module thru AT commands.

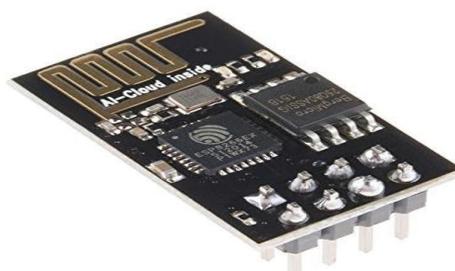
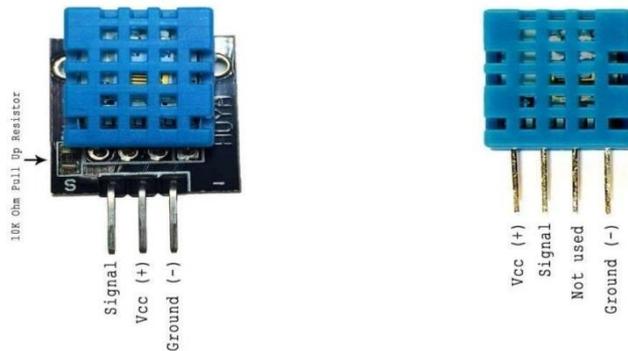


Figure 4: Wi-Fi Module

**d. Temperature and Humidity Sensor**

The DHT11 sensor detects water vapor via calibrating the electrical resistance among electrodes. The moisture sensing material is a moisture-maintaining base with electrodes carried out to the surface. When water vapor is absorbed via the substrate, ions are discharged via the substrate a good way to growth the conductivity a few of the electrodes. The extrade in resistance a few of the 2 electrodes is proportional to the relative moisture. Higher relative moisture decreases the resistance a few of the 2 electrodes, During lower relative humidity will growth the resistance a few of the electrodes.



**Figure 5:** Temperature and Humidity Sensor

**e. Heartbeat Sensor**

The heartbeat sensor is used based on the principle of photoplethysmography. It measures the pulses change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (avascular region). In the case of applications where the patient heart pulse rate is to be monitored, the timing of the pulses is more important.



**Figure 6:** Heartbeat Sensor

**f. MQ-135 Air Quality Sensor**

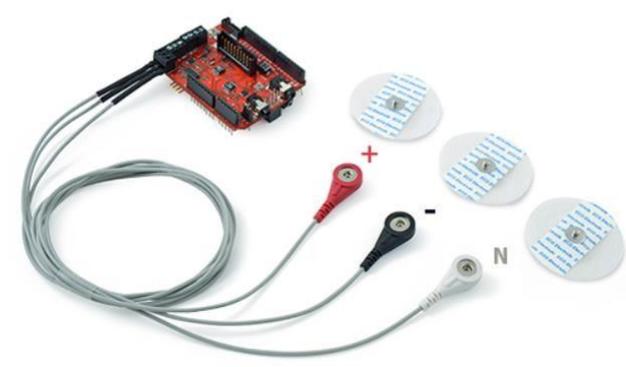
The air quality sensors are used for air quality control systems and are suitable for detecting or measuring NH<sub>3</sub>, Alcohol, Benzene, Smoke, and CO<sub>2</sub> gases. MQ135 gas sensor has a high sensitivity to Ammonia, Sulfide, and Benzene steam, also sensitively to smoke and other harmful gases. The MQ-135 gas sensor module comes with a Digital Pin which makes this sensor operate even without a microcontroller and that comes in handy when you are only trying to detect one particular gas. If you need to measure the gas in PPM the analog pin needs to be used. The analog pin is a TTL port and works on 5V and so can be used with the most common microcontrollers. It is with low cost and particularly suitable for Air quality sensors for monitoring applications.



**Figure 7:** Air Quality Sensor

**g. ECG Sensor**

Electrocardiography or ECG is a technique for collecting electrical signals which are generated from the human heart. When someone experiences physiological arousal then the ECG sensor allows us to recognize the level of the patient, however, it is also used for understanding the psychological state of humans.



**Figure 8:** AD8232 ECG Sensor

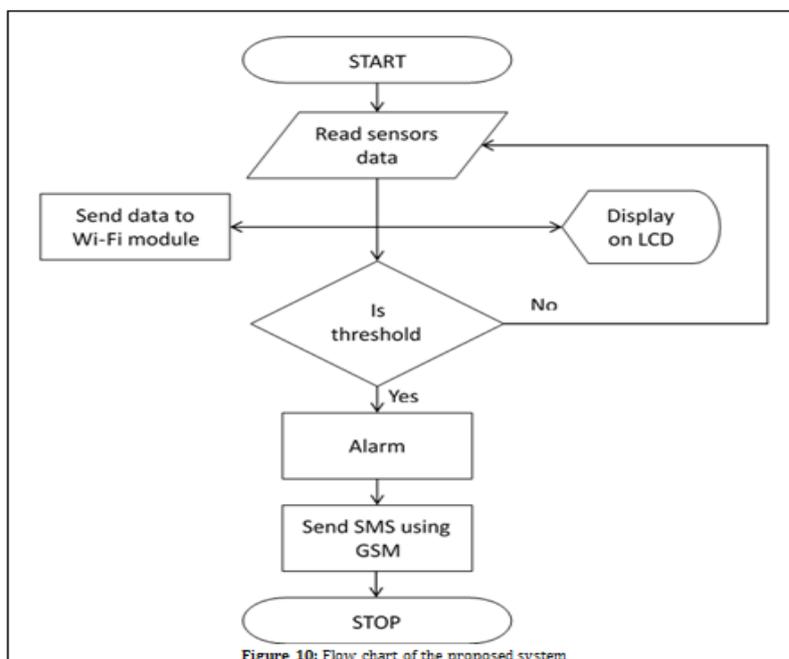
**h. I2C LCD**

I2C LCD is an easy-to-use display module, it can make the display easier and reduces the difficulty of connections because it uses just four wires. I2C module has an inbuilt PCF8574 I2C module that translates I2C serial data to parallel data for the LCD Display. This system used the I2C LCD to display the current Bus stop name.



**Figure 9:** I2C LCD

**i. Flowchart**



**Figure 10:** Flow chart of the proposed system

### III. RESULTS AND DISCUSSION

Hardware structure is as shown in Figure 11 and below Figures 11(a), (b), (c), and (d),(e) show the Output of the system.

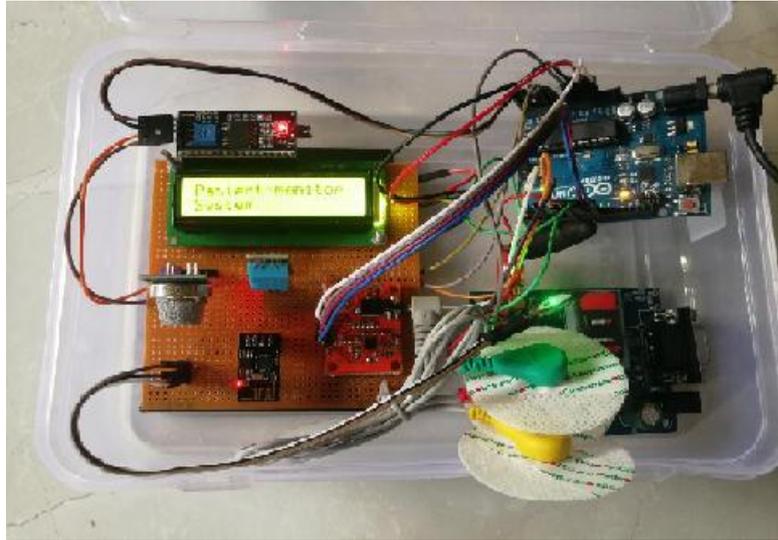


Figure 11: Hardware Of System

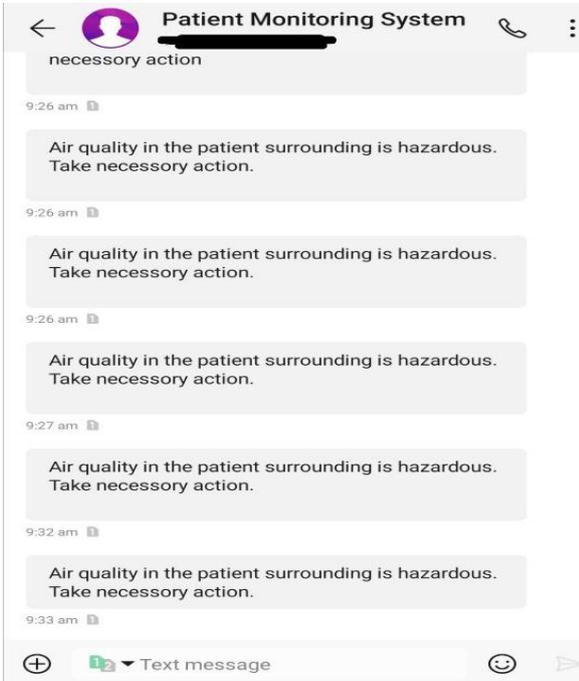


Figure11(a): Message Send To Mobile Number

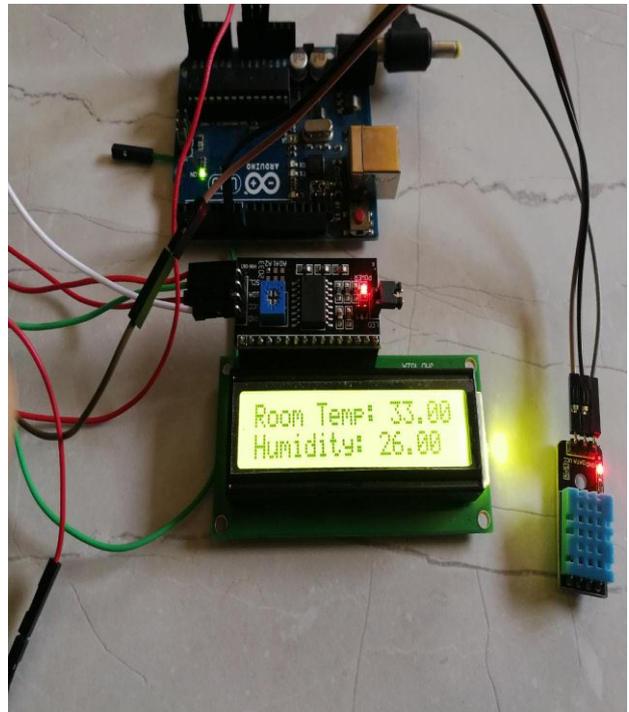
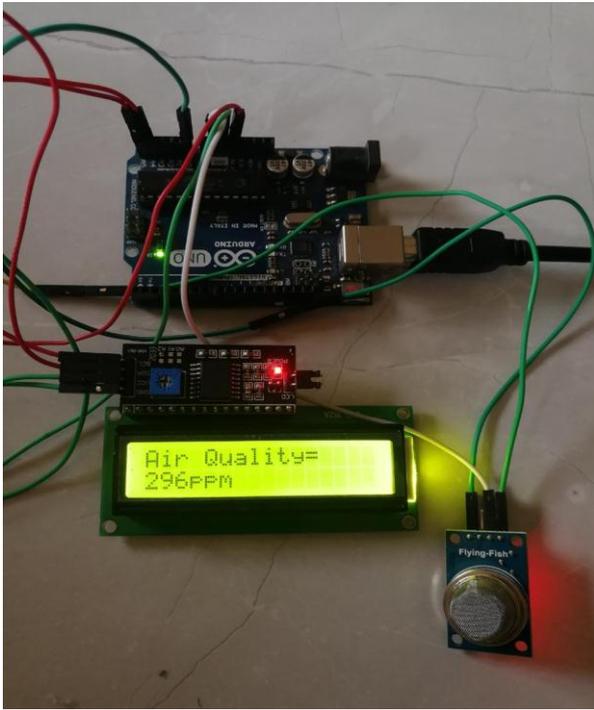
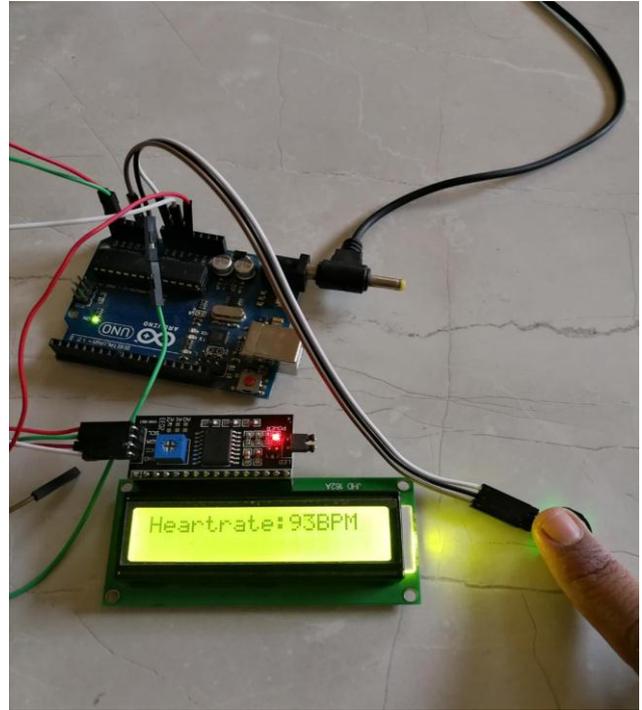


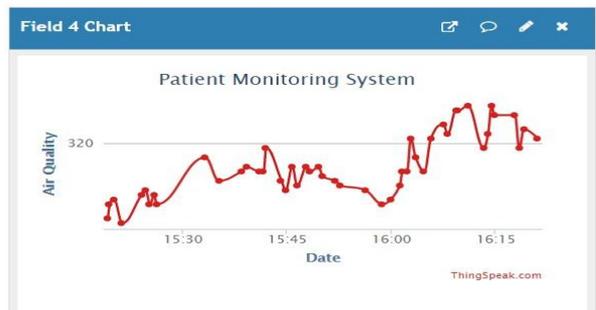
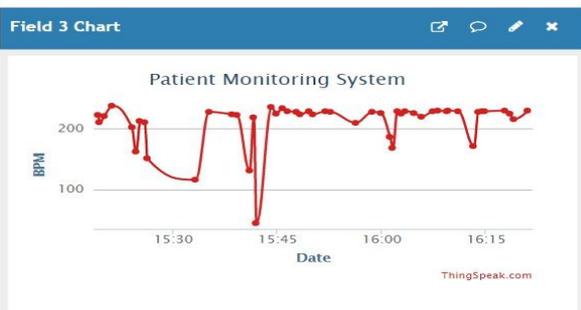
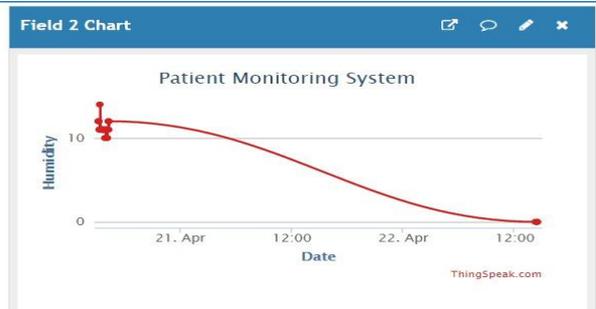
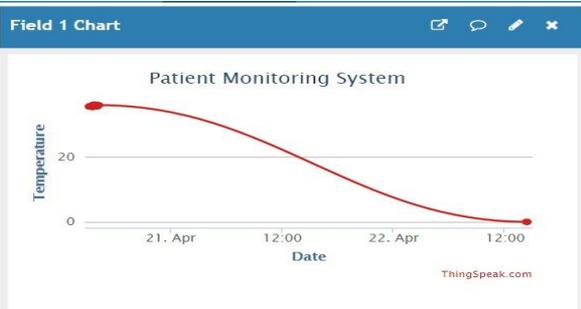
Figure11(b): Temperature and Humidity Sensor



**Figure1(c):** Air Quality Sensor



**Figure(d):** Heartbeat Sensor



**Figure11(e):** Message Sending To IoT Platform

The framework of the patient monitoring system is as follows. For monitoring, remote patients sensors such as temperature, humidity, Heartbeat, ECG, Air quality are interfaced with Arduino Uno. After some processing, data is displayed on 16 x 2 LCD. Using ESP 8266 Wi-Fi module, the same data is sent to the IoT platform. If the sensor values go beyond the threshold we have set, an SMS alert will be sent to a mobile no feed in the system. GSM modem is used to send the SMS. Also, the alarm rings in this case.

#### IV. CONCLUSION

We used a cloud computing mechanism to store information, this data can be stored safely over time and can be accessed at any moment. Cloud processing is additionally helpful to keep an update on the patient. Specialists and doctors can easily look into the patient reports at the time of emergency and can take appropriate steps accordingly. Hence giving proper suggestions at the proper time to prevent a crisis. The concerned person can deal with the patient without their actual physical presence the system automatically creates the diagram of body changes and reports to the doctor about the recent change of events. The body temperature parameter is so significant that a doctor can easily predict the problem patient is going through and also will save time. This project is very helpful for people living in remote areas and doesn't have access to all the medical facilities. This can be signified as a small home clinic where u can just sit and get a regular checkup done.

#### V. REFERENCES

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