IoT BASED IMMOBILITY PATIENTS MONITORING SYSTEM

MINI PROJECT- I REPORT

Submitted by

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SURYAVADHANI D	**717821E155**

in partial fulfilment of the requirements for the degree

of

BACHELOR OF ENGINEERING

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(Internal Examiner)

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ABSTRACT

The most common disease that results in immobility is Paralysis. Paralysis is the inability to move muscles. It can be temporary or permanent. The most common causes are stroke, spinal cord injury, and multiple sclerosis. Paralysis can be a complete loss of movement known as a significant weakness called paresis. Even though, there are innovative approaches for curing or treating paralysis patients, but it still cannot make the patient to convey their needs and the aim of our project is to help a person to convey their needs by making them as independent as possible. Many innovative devices have been developed, but they are very large in size and expensive machines. They seem to be only available in hospitals and not able to be used at the patient's home or at their convenience. Our goal is to make a device for immobility patients that will be able to use it themselves and it is budget friendly for them to afford without much debt .

LIST OF FIGURES

LIST OF ABBREVIATIONS

LCD	Liquid crystal display
IoT	Internet of things
MEMS	Micro electromechanical systems
DMP	Digital motion processor
SCL	Serial clock
SDA	Serial data
LED	Light emitting diode
IC	Integrated circuit
PCB	Printed circuit board
deg/s	degrees per second
ESP	Extra Sensory Perception
MPU	Memory Protection Unit

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CHAPTER-1

INTRODUCTION

CHAPTER-1
INTRODUCTION

The system makes use of a micro controller based circuitry to achieve this functionality. It makes use of a hand motion recognition circuit and a receiver plus transmitter circuit. The hand motion circuit is used to detect hand movements using accelerometer and gyro and then transmit this information wirelessly over RF to the receiver system.

The receiver system is designed to receive and process those commands and display them over the LCD display as well as transmit the data online over to the IoT server. The IoT server then displays this information online, to achieve the desired output. This system also monitors patient's heartbeat and temperature, if it exceeds normal value then message will be shown on LCD to doctors and caretakers who attends patient.

ESP32 is the main core of our project. It performs all the arithmetic and logical operation and control all the peripheral device connected to it according to the code written. Our project main aim is to convey their needs also monitor the patient health. For that purpose we used MPU 6050 it consists of Accelerometer & Gyro, temperature sensor to sense their gesture and convey the gesture as a message to their needs also to measure the body temperature respectively.

To convey the message according the gesture and the health condition of the patient here we use LCD display. Further to notify the patients health to their family member and other loved people we have send the data into internet server. For these purpose we have used ESP32 Wi-Fi module which internet server where family member, doctors can easily access the patient health condition in their smartphone.

CHAPTER-2
PROJECT DESCRIPTION

CHAPTER-2
PROJECT DESCRIPTION

2.1 EXISTING SYSTEM

2.1.1 Block diagram:

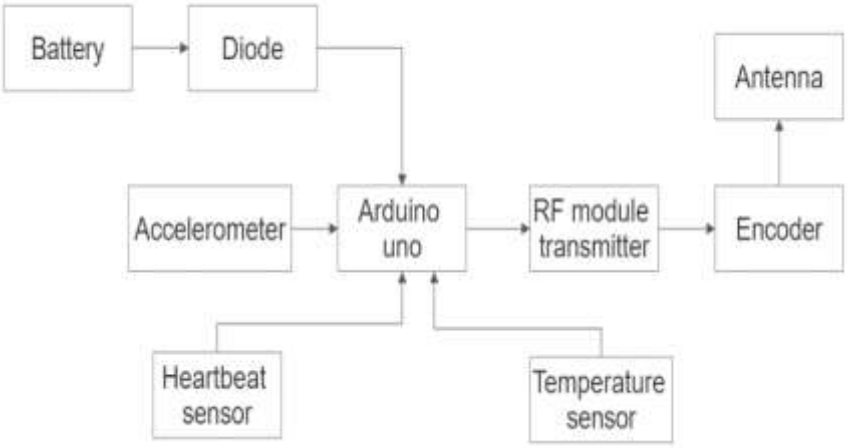

Fig 2.1: Transmitter Block diagram

Transmitter circuit gets supply from the battery and the current flows through the diode to the Arduino uno. It is connected to Accelerometer which is used to sense hand gesture and two sensors namely, temperature sensor to sense temperature and heartbeat sensor to heart beat it sends the data to RF module transmitter, it encodes and send it to the receiver circuit through antenna as shown in Fig 2.1

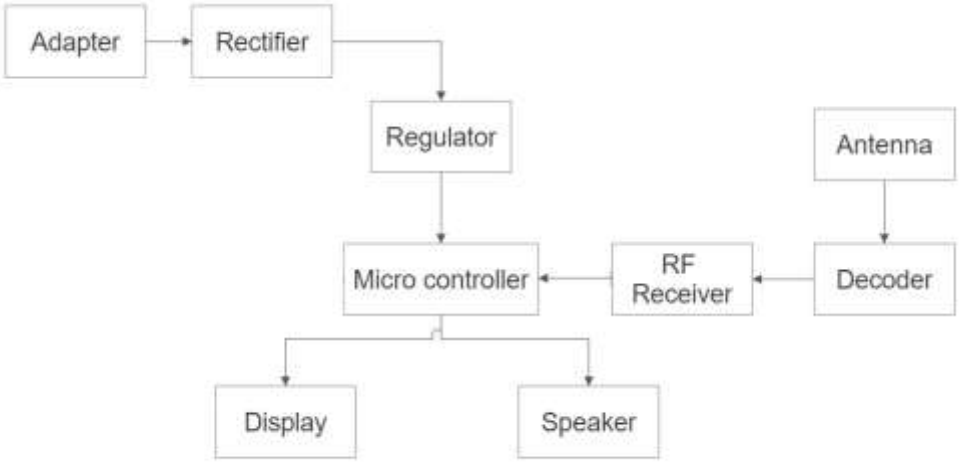

Fig 2.2: Receiver Block diagram

From the transmitter with the help of antenna, the receiver block receives the data,decodes and gives it to RF receiver, it sends data to microcontroller, it sends data to Microcontroller, it displays the output in a 3 way through LCD display, Speaker and IoT website with the help of Wi-Fi module as shown in Fig 2.2

2.2 PROPOSED SYSTEM

2.2.1 Block diagram

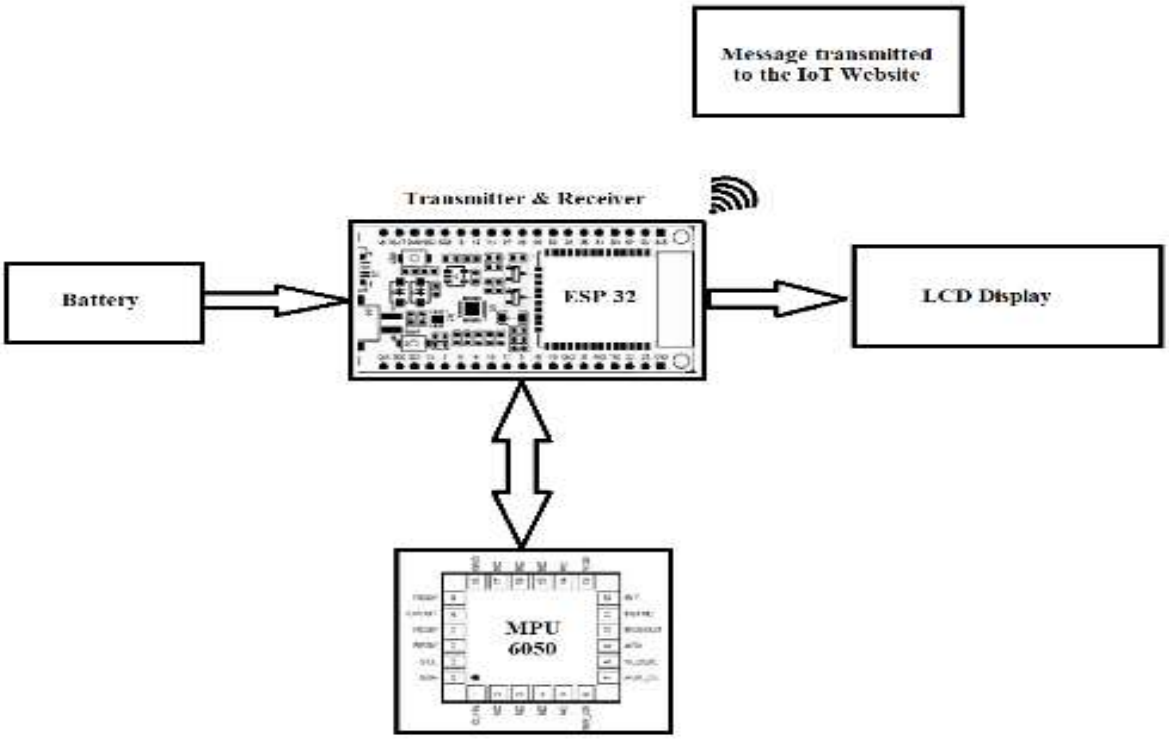

Fig 2.3: Proposed block diagram

The supply is come through the battery to ESP32 which is a Wi-Fi module, It sends the supply to MPU6050, it contains 3 axis accelerometer and gyroscope. Accelerometer is used to sense the hand gesture and gyroscope will measure the angle of gesture.it sends the data to IoT website namely pavantech with the help of ESP32 (Wi-Fi module). The MPU6050 also contains temperature sensor which may utilized in future as shown in Fig 2.3

2.2.2 Circuit diagram

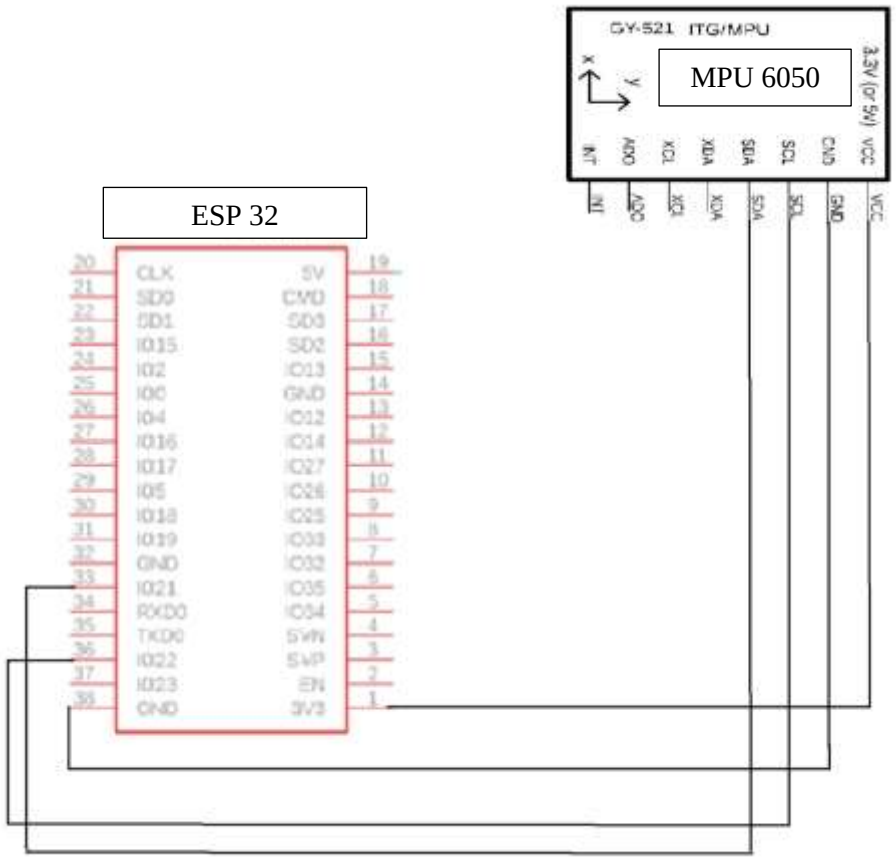

Fig 2.4: CIRCUIT DIAGRAM

- ESP32 is a Wi-Fi module device which contains 38 pins including ground and VCC and MCU 6050 is a microprocessor which senses the needs of the project which is gesture and temperature, that contains 8 pins including ground and VCC.
- Clock pin from mpu6050 is connected to D22 in esp32.
- Data pin from the mpu6050 is connected to the D21 in esp32 to transfer data.

2.3 MPU 6050:

Gyro sensors, also known as angular rate sensors or angular velocity sensors are devices that sense angular velocity. In simple terms, angular velocity is the change in rotational angle per unit of time. Angular velocity is generally expressed in deg/s (degrees per second). An accelerometer is a device that measures proper acceleration (or rate of change of velocity) of a body in its own instantaneous rest frame, is not the same as coordinate acceleration, being

the acceleration in a fixed coordinate system. The GY-521 module is a breakout board for the MPU-6050 MEMS (Micro electromechanical systems) that features a 3-axis gyroscope, a 3-axis accelerometer, a digital motion processor (DMP), and a temperature sensor. The digital motion processor can be used to process complex algorithms directly on the board. Usually, the DMP processes algorithms that turn the raw values from the sensors into stable position data. The sensor values are retrieved by using the I2C serial data bus, which requires only two wires (SCL and SDA) shown in fig 2.1.

Fig 2.5: Accelerometer and Gyro

2.3.1 Pin diagram:

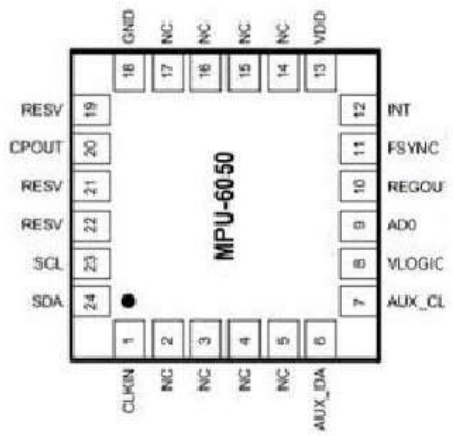

Fig 2.6: MPU-6050 Pin layout

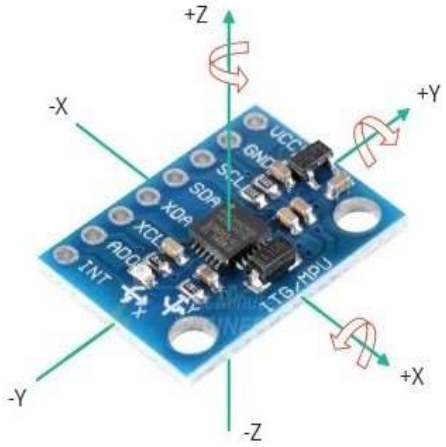

Fig 2.7: Axis of MUP-6050

2.4 ESP32 WI-FI MODULE:

An ESP8266 Wi-Fi module is a SOC microchip mainly used for the development of end-point IoT (Internet of things) applications. It is referred to as a standalone wireless transceiver, available at a very low price. It is used to enable the internet connection to various applications of embedded systems. It provides the solutions to meet the requirements of industries of IoT such as cost, power, performance, and design. The ESP8266 Wi-Fi module is highly integrated with RF balun, power modules, RF transmitter and receiver, analog

transmitter and receiver, amplifiers, filters, digital baseband, power modules, external circuitry, and other necessary components as shown in Fig 2.8

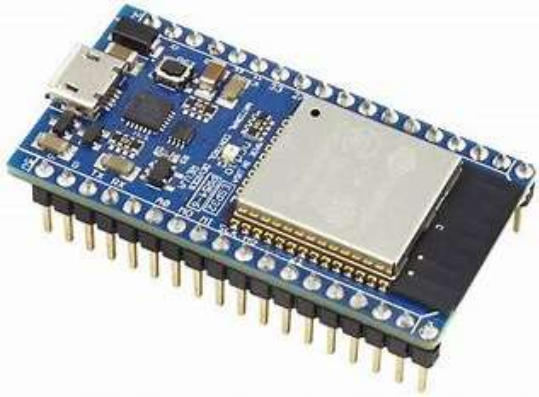

Fig 2.8: ESP32 wi-fi module

2.4.1 Pin diagram:

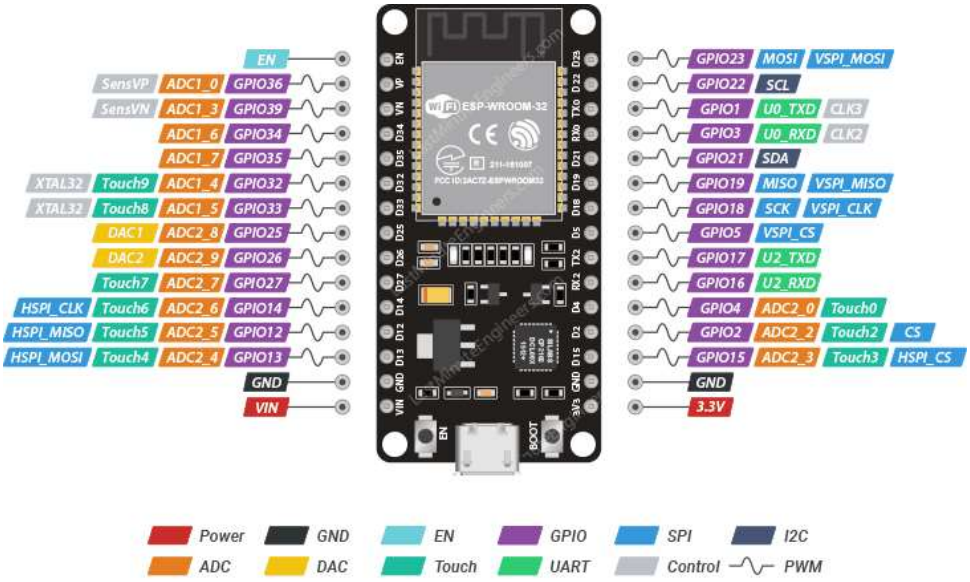

Fig 2.9: ESP32 wi-fi module pin diagram

2.5 CRYSTAL OSCILLATOR:

A crystal oscillator is an electronic oscillator that makes use of crystal as a frequency selective element to obtain an inverse piezoelectric effect. It makes use of the mechanical resonance of the vibrating crystal, which has piezoelectric properties, in order to obtain an electric signal with a high-precision frequency. Crystal oscillators are considered superior to ceramic resonators as they have higher stability, higher quality, lower cost and are smaller in

size. Crystal oscillators are a prime example of fixed-frequency oscillators where accuracy and stability are the most important considerations. They usually use the same circuits as other types of oscillators, with the difference being the crystal replacing the tuned circuit. In crystal oscillators, the crystal vibrates as a resonator and the resulting frequency determines the oscillation frequency. In other words, the crystal acts like a circuit having an inductor, resistor, and capacitor with precise resonant frequency. In some cases, in order to have better thermal stability for the crystal oscillator, temperature compensation is applied.

Fig 2.10: Crystal oscillator

2.6 DIODE:

A diode is a semiconductor device that essentially acts as a one-way switch for current. It allows current to flow easily in one direction, but severely restricts current from flowing in the opposite direction. Diodes are also known as rectifiers because they change alternating current (ac) into pulsating direct current (dc). Diodes are rated according to their type, voltage, and current capacity. Diodes have polarity, determined by an anode (positive lead) and cathode (negative lead). Most diodes allow current to flow only when positive voltage is applied to the anode. When a diode allows current flow, it is forward-biased. When a diode is reverse-biased, it acts as an insulator and does not permit current to flow. The diode symbol's arrow points against the direction of electron flow. Reason: Engineers conceived the symbol, and their schematics show current flowing from the positive (+) side of the voltage source to the negative (-). It's the same convention used for semiconductor symbols that include arrows—the arrow points in the permitted direction of "conventional" flow, and against the permitted direction of electron flow.

Fig 2.11: Diode

2.7 RESISTOR:

Resistor is plays a major role in reducing the current in circuits and therefore protecting circuits from damage resulting from overdraw of current by dissipating the kinetic energy of electrons in current as thermal energy (heat). This is what allows electricity to be useful: the electrical potential energy from the voltage source is converted to kinetic energy of the electrons, which is then transferred to something we wish to power, such as a toaster or a laptop. The heat dissipation within a resistor is simply the power dissipated across that resistor since power represents energy per time put into a system. So the relevant equation is the equation for power in a circuit.

Fig 2.12: Resistor

2.8 CAPACITOR:

Capacitor is whenever power (energy) in the form of voltage times current is applied to a capacitor, part of that total power is used or "lost" within the capacitor itself. The ratio of this "power loss" to the total power supplied is the "power factor" (PF) of the capacitor. This PF figure then is a measurement factor for rating the "inefficiency" of the power transfer capabilites of the capacitor. For

those capacitors where the PF figure is .1 (10%) or less, a ratio figure known as the "dissipation factor" (DF) is more commonly used. The reason for this usage of the DF figure is simply a conveni-ence that takes advantage of the fact that DF mea-surements on a capacitor are much simpler and easier to make on standard capacitance bridges than the determination of PF.

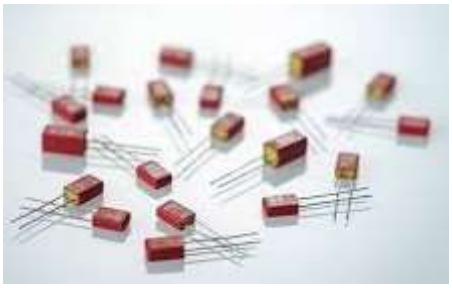

Fig 2.13: Capacitor

2.9 IC:

An integrated circuit (IC), sometimes called a chip, microchip or microelectronic circuit, is a semiconductor wafer on which thousands or millions of tiny resistors, capacitors, diodes and transistors are fabricated. An IC can function as an amplifier, oscillator, timer, counter, logic gate, computer memory, microcontroller or microprocessor. An IC is the fundamental building block of all modern electronic devices. As the name suggests, it's an integrated system of multiple miniaturized and interconnected components embedded into a thin substrate of semiconductor material.

Fig 2.14:IC

2.10 PCB and BREADBOARD:

A breadboard is a type of prototyping that requires no soldering connections. This will make them less permanent compared to a PCB. Breadboards have sockets that you push the components into, allowing you to remove and change them if needed. It is used for building temporary circuits. It is useful to designers because it allows components to be removed and

replaced easily. It is useful to the person who wants to build a circuit to demonstrate its action, then to reuse the components in another circuit.

Fig 2.15: Bread board

Fig 2.16: PCB

2.11 Cables and Connectors:

A cable connector is the component that you attach to the end of a cable so that it can plug into a port or an interface of an electronic system. Most connectors are either male or female gender; the males have one or more exposed pins and the female contains holes for those male pins to insert into.

Fig 2.17: Cables and Connectors

2.12 LED :

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The colour of the light is determined by the energy required for electrons to cross the band gap of the semiconductor.

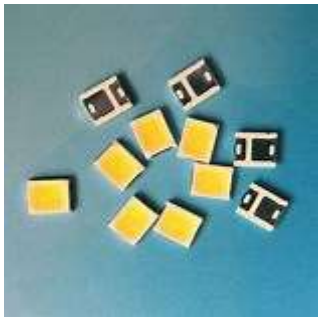

Fig 2.18: LED

2.13 Push Buttons:

The push button switch is usually used to turn on and off the control circuit, and it is a kind of control switch appliance that is widely used. It is used in electrical automatic control circuits to manually send control signals to control contactors, relays, electromagnetic starters, etc. Its characteristic is that it is installed in the machine and instrument in the process of work, most of the time is in the initial free state position, and only when needed, it is converted to the second state (position) under the action of external force. Once the external force is removed, due to With the action of the spring, the switch returns to the initial position.

Fig 2.19: Push button switch

2.14 Transistors :

A transistor is a semiconductor device used to amplify or switch electrical signals and power. The transistor is one of the basic building blocks of modern electronics.[1] It is composed of semiconductor material, usually with at least three terminals for connection to an electronic circuit. A voltage or current applied to one pair of the transistor's terminals controls the current through another pair of terminals. Because the controlled (output) power can be

higher than the controlling (input) power, a transistor can amplify a signal. Some transistors are packaged individually, but many more are found embedded in integrated circuits.

Fig 2.20:Transistor

2.15 DEVICE SPECIFICATION:

- ESP32 Wi-fi Module
- MPU6050
- LCD
- Cables and Connectors
- PCB and Breadboards

2.16 BUDGET PLAN:

Si.no	Components	Quantity	Price
1.	MPU 6050	1	200
2.	ESP32 Wi-fi Module	2	550
3.	LCD Display	1	200
4.	Adapter	1	200
5.	Connecting wires	As required	50
Total cost			1,200

Table 2.1 Budget plan

2.17 WORK PLAN:

Nature of Work / Months	1 months	2 months	3 months	4 months
sensors and control components				
Design and integration of modules				
Programming of the micro-controllers				
Testing and validation				

Table 2.2 Work plan

CHAPTER 3

OUTPUT&RESULT

CHAPTER 3

OUTPUT&RESULT:

The work of *IoT BASED IMMOBILITY PATIENTS MONITORING SYSTEM* is the medical based project aiming to convey the needs of paralysis patient and making them as independent as possible. This system helps patient overcome barriers to convey their needs without putting efforts. Moreover this can be modified to be used for several purposes where persons mobility is affected. The practical implementation of the idea has been brought successfully.

The IoT website Link is given below:

https://pgcresearch.pavantech.in/gaja/newtheme/solar/patient_monitoring.php

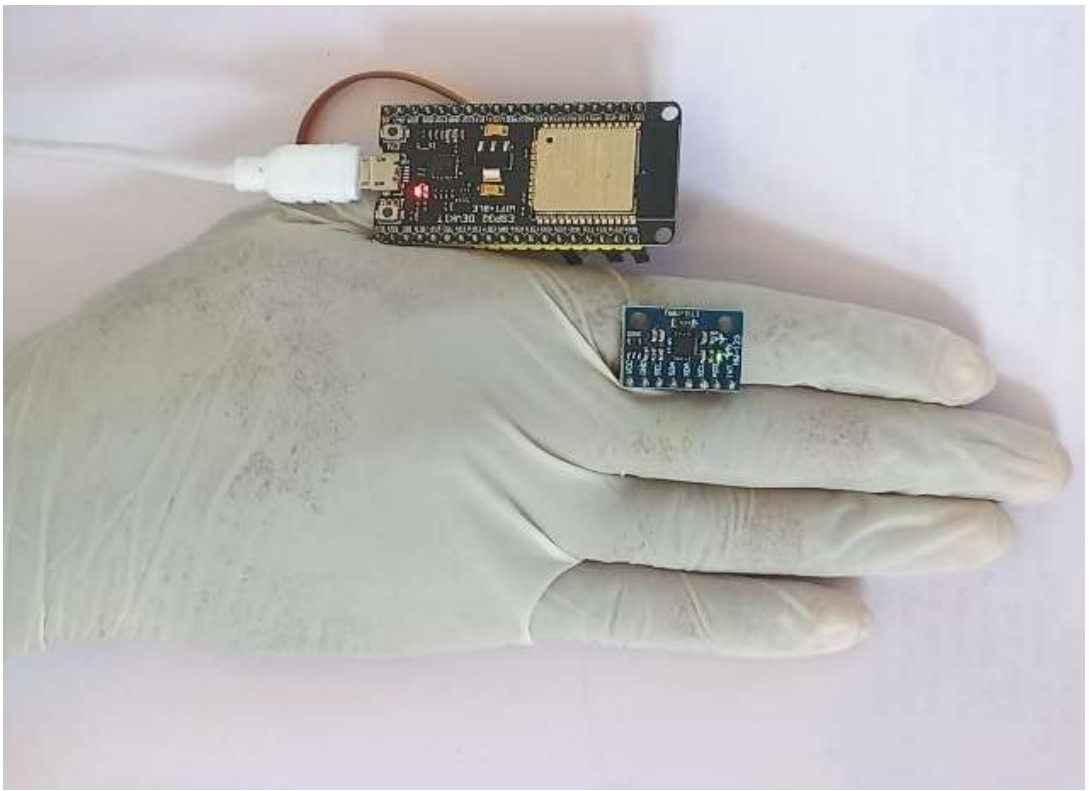

Fig 3.1 Pictorial Result

The above fig 3.1 is the pictorial representation of the final output of our project

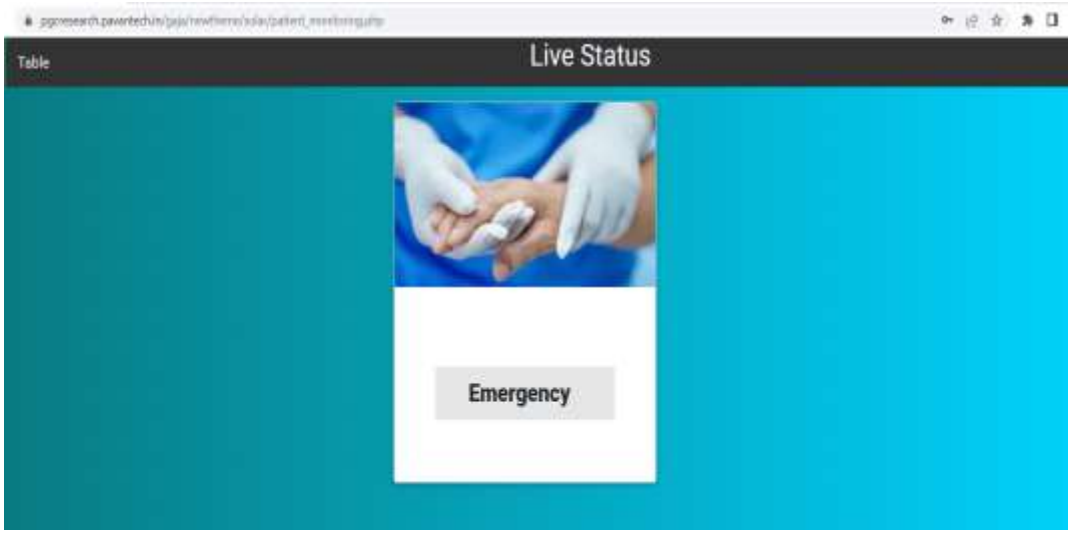

Fig 3.2 IoT Server Page

The above fig 3.2 is the picture of the IoT website of our project

S_No	Status	Date_Time
154	Need Water	2022-09-16 21:05:56
153	Emergency	2022-09-16 21:05:49
152	Emergency	2022-09-16 21:05:42
151	Emergency	2022-09-16 21:05:34
150	Need Water	2022-09-16 21:05:27
149	Emergency	2022-09-16 21:05:07
148	Need Water	2022-09-16 21:04:37
147	Need Water	2022-09-16 21:04:27
146	Need Water	2022-09-16 21:04:20
145	Emergency	2022-09-16 21:04:12
144	Need Water	2022-09-16 21:04:05
143	Need Water	2022-09-16 21:03:58
142	Emergency	2022-09-16 21:03:50

Fig 3.3 IoT Server Database table

The above fig 3.3 is the datasheet of the past outputs of the project where we can refer the recent activities of the patients.

CHAPTER 4

CONCLUSION

CHAPTER 4

CONCLUSION

This system based design of IoT based Immobility patients monitoring system is beneficial for paralysis patients who can't able to convey their needs, the practical application is very useful , needful and feasibility. It will make the patient to think positive and get better soon by being psychologically strong. In future scope this system could also be implemented using LED to display output and temperature sensor may be added. Also design can be implemented to send the health condition of the patient to the Doctor straight to take better care of the patients.

As conclusion, the system which designed in this work was perform very well, for every gesture of hand, the output is displayed as per the program through the IoT website namely pavantech. The IoT based immobility patient monitoring system was put under a series of tests for ascertaining its performance as a monitoring system and very satisfactory results were obtained. This device was also found to be sufficiently quick, so that the safety of the equipment protection by the device under any undesired transient condition of the main supply is ensured.

This device has a very high sensitivity. It is also simple in design, reliable in operation and cost competitive with any other product available in the market. From the above analysis, it is concluded that this device can easily monitor the patients need by sensing the hand gesture.

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10) Walia, G. S., Singh, P., Singh, M., Abouhawwash, M., Park, H. J. et al. (2022). ThreeDimensional Optimum Node Localization in Dynamic Wireless Sensor Networks. CMCComputers, Mater

APPENDIX

```
#include <WiFi.h>
#include <WiFiClient.h>
#include <WebServer.h>
#include <Adafruit_MPU6050.h>
#include <Adafruit_Sensor.h>
#include <HTTPClient.h>
Adafruit_MPU6050 mpu;
int Led_OnBoard = 2;
// Initialize the Led_OnBoard
const char* ssid = "DHRUVA2";
// Your wifi Name
const char* password = "eeed2022";
// Your wifi Password
String Status;
void setup() {
// put your setup code here, to run once:
delay(1000);
pinMode(Led_OnBoard, OUTPUT);
// Initialize the Led_OnBoard pin as an output
Serial.begin(115200);
WiFi.mode(WIFI_OFF);
//Prevents reconnection issue (taking too long to connect)
delay(1000);
WiFi.mode(WIFI_STA);
//This line hides the viewing of ESP as wifi hotspot
WiFi.begin(ssid, password);
//Connect to your WiFi router
Serial.println("");
Serial.print("Connecting");
// Wait for connection
while (WiFi.status() != WL_CONNECTED) {
digitalWrite(Led_OnBoard, LOW);
delay(250);
```

```
Serial.print(".");
digitalWrite(Led_OnBoard, HIGH);
delay(250);
}
digitalWrite(Led_OnBoard, HIGH);
//If connection successful show IP address in serial monitor
Serial.println("");
Serial.println("Connected to Network/SSID");
Serial.print("IP address: ");
Serial.println(WiFi.localIP());  //IP address assigned to your ESP

while (!Serial)
delay(10);
// will pause Zero, Leonardo, etc until serial console opens
Serial.println("Adafruit MPU6050 test!");
// Try to initialize!
if (!mpu.begin()) {
Serial.println("Failed to find MPU6050 chip");
while (1) {
delay(10);
}
}
Serial.println("MPU6050 Found!");
mpu.setAccelerometerRange(MPU6050_RANGE_8_G);
Serial.print("Accelerometer range set to: ");
switch (mpu.getAccelerometerRange()) {
case MPU6050_RANGE_2_G:
Serial.println("+-2G");
break;
case MPU6050_RANGE_4_G:
Serial.println("+-4G");
break;
case MPU6050_RANGE_8_G:
Serial.println("+-8G");
break;
```

```
case MPU6050_RANGE_16_G:
Serial.println("+-16G");
break;
}
mpu.setGyroRange(MPU6050_RANGE_500_DEG);
Serial.print("Gyro range set to: ");
switch (mpu.getGyroRange()) {
case MPU6050_RANGE_250_DEG:
Serial.println("+- 250 deg/s");
break;
case MPU6050_RANGE_500_DEG:
Serial.println("+- 500 deg/s");
break;
case MPU6050_RANGE_1000_DEG:
Serial.println("+- 1000 deg/s");
break;
case MPU6050_RANGE_2000_DEG:
Serial.println("+- 2000 deg/s");
break;
}
mpu.setFilterBandwidth(MPU6050_BAND_21_HZ);
Serial.print("Filter bandwidth set to: ");
switch (mpu.getFilterBandwidth()) {
case MPU6050_BAND_260_HZ:
Serial.println("260 Hz");
break;
case MPU6050_BAND_184_HZ:
Serial.println("184 Hz");
break;
case MPU6050_BAND_94_HZ:
Serial.println("94 Hz");
break;
case MPU6050_BAND_44_HZ:
Serial.println("44 Hz");
break;
```

```
case MPU6050_BAND_21_HZ:
Serial.println("21 Hz");
break;
case MPU6050_BAND_10_HZ:
Serial.println("10 Hz");
break;
case MPU6050_BAND_5_HZ:
Serial.println("5 Hz");
break;
}
Serial.println("");
delay(100);
}
void loop() {
// put your main code here, to run repeatedly:
HTTPClient http;
//Declare object of class HTTPClient
/* Get new sensor events with the readings */
sensors_event_t a, g, temp;
mpu.getEvent(&a, &g, &temp);
String StatusPost,postData;
/* Print out the values */
//  Serial.print("Acceleration X: ");
//  Serial.print(a.acceleration.x);
//  Serial.print(", Y: ");
//  Serial.print(a.acceleration.y);
//  Serial.print(", Z: ");
//  Serial.print(a.acceleration.z);
//  Serial.println(" m/s^2");
//  Serial.print("Rotation X: ");
//  Serial.print(g.gyro.x);
//  Serial.print(", Y: ");
//  Serial.print(g.gyro.y);
//  Serial.print(", Z: ");
//  Serial.print(g.gyro.z);
```

```
//  Serial.println(" rad/s");
//  Serial.print("Temperature: ");
//  Serial.print(temp.temperature);
//  Serial.println(" degC");
Serial.println("");
if(a.acceleration.x>7)
{
Serial.println("Need Water");
Status     = "Need Water";
StatusPost = String(Status);   //String to interger conversion
postData = "Status=" + StatusPost;
http.begin("https://pgcresearch.pavantech.in/gaja/newtheme/solar/InsertDB1.php");
http.addHeader("Content-Type", "application/x-www-form-urlencoded");
//Specify content-type header
int httpCode = http.POST(postData);
//Send the request
String payload = http.getString();
//Get the response payload
//Serial.println("LDR Value=" + ldrvalue);
Serial.println(httpCode);
//Print HTTP return code
Serial.println(payload);
//Print request response payload
//Serial.println("Lamp_ID=" + Lamp_IDPost + "Status=" + StatusPost + "latitude=" +
latitudePost
+"longitude=" + longitudePost + "info=" + infoPost+"icon=" + iconPost);
Serial.println("Status=" + StatusPost);
http.end();  //Close connection
delay(4000);
//Here there is 4 seconds delay plus 1 second delay below, so Post Data at every 5
seconds
digitalWrite(Led_OnBoard, LOW);
delay(1000);
digitalWrite(Led_OnBoard, HIGH);}
if(a.acceleration.y>7)
```

```
{
Serial.println("Emergency");
Status     = "Emergency";
StatusPost = String(Status);
//String to interger conversion
postData = "Status=" + StatusPost;
http.begin("https://pgcresearch.pavantech.in/gaja/newtheme/solar/InsertDB1.php");
http.addHeader("Content-Type", "application/x-www-form-urlencoded");
//Specify content type header
int httpCode = http.POST(postData);
//Send the request
String payload = http.getString();
//Get the response payload
//Serial.println("LDR Value=" + ldrvalue);
Serial.println(httpCode);
//Print HTTP return code
Serial.println(payload);
//Print request response payload
//Serial.println("Lamp_ID=" + Lamp_IDPost + "Status=" + StatusPost + "latitude=" + latitudePost
+"longitude=" + longitudePost + "info=" + infoPost+"icon=" + iconPost);
Serial.println("Status=" + StatusPost);
http.end();
//Close connection
delay(4000);
//Here there is 4 seconds delay plus 1 second delay below, so Post Data at every 5
seconds
digitalWrite(Led_OnBoard, LOW);
delay(1000);
digitalWrite(Led_OnBoard, HIGH);}
}
```