19L620 – INNOVATION PRACTICES

SMART ASSISTIVE DEVICE FOR BED-RIDDEN

20L108 - Dhevaa Dharshini B

20L126- Nakul R

20L141- Sheena S

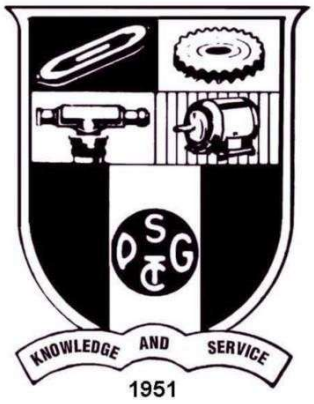
21L410 – Natheeshkumar B

Project report submitted in partial fulfillment of the requirements for the degree of

BACHELOR OF ENGINEERING

Branch: ELECTRONICS AND COMMUNICATION ENGINEERING

Of Anna University



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(Faculty In-charge) (HOD)

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(Faculty In-charge) (HOD)

Certified that the candidate was examined on

(Internal Examiner) (External Examiner)

CONTENTS

CHAPTER:1

INTRODUCTION

1.1 NEED FOR THE WORK

Bedridden People are restricted to bed and need assistance from normal people for water and other essential things. Special care must be taken for them, sometimes the care is not provided. They are prone to many difficulties such as bed sores, kidney failures, muscular cramps etc. According to doctors advice, a bedridden person requires 3000 cc of water per day. People are bedridden due to various reasons such as due to accidents, old age people due to illness, bed rest etc. All these people require assistance personally or through some mechanical devices.

1.2. OBJECTIVES FOR THE WORK

Water is a very important required substance in order to sustain vital activities of humans such as nutrition, respiration, circulation, excretion and reproduction. In addition water is also a life space as well as being one of the basic substances in the formation of life environment. When a person is bedridden he cannot drink water without any assistance.In this project, we have built a smart assistive device for bedridden people using NodeMCU and MPU6050 .

1.3 OVERVIEW FOR THE WORK

The objectives of the project includes, to create a smart assistive device for bedridden person,to create an automatic water dispenser and to create a low cost smart assistive device.The need for the work is Bedridden People are restricted to bed and need assistance from normal people for water and other essential things. Special care must be taken for them,sometimes the care is not provided. Assistive devices can help bedridden people so that assistance in certain activities can be avoided.

CHAPTER 2

LITERATURE SURVEY

- According to a recent study conducted by a hospital, one of the common complications associated with bedridden patients is urinary infections.
- The main cause is prolonged catheter usage, which can then lead to any of the following occurrences: a burst or torn urine receptacle; patients not getting enough liquid each day; and urine return issues.
- states that adults need 2.5 litres of water daily. If not ingested, a person may suffer from several urinary infections.
- It, says about the Symptoms of Urinary Tract Infections in Older Adults. Dehydration is usually caused by not drinking enough fluid to replace what we lose. The climate, the amount of physical exercise you are doing (particularly in hot weather) and your diet can contribute to dehydration

CHAPTER 3

PROPOSED WORK

3.1WORKING:

The working of our project is as follows ,there are two main modules

- The transmitter Node MCU
- The Receiver Node MCU
  The patients hand movement is continuously monitored for change in position and rotation ,which is eventually sensed by the gyroscopic sensor which is playing a major role in our project.the data is sent to the receiver Node MCU, where they are classified into different activities ,these activities are sent to the receiver Node MCU,where the fan,buzzer and water pump is turned on based on the activity

3.2BLOCK DIAGRAM:

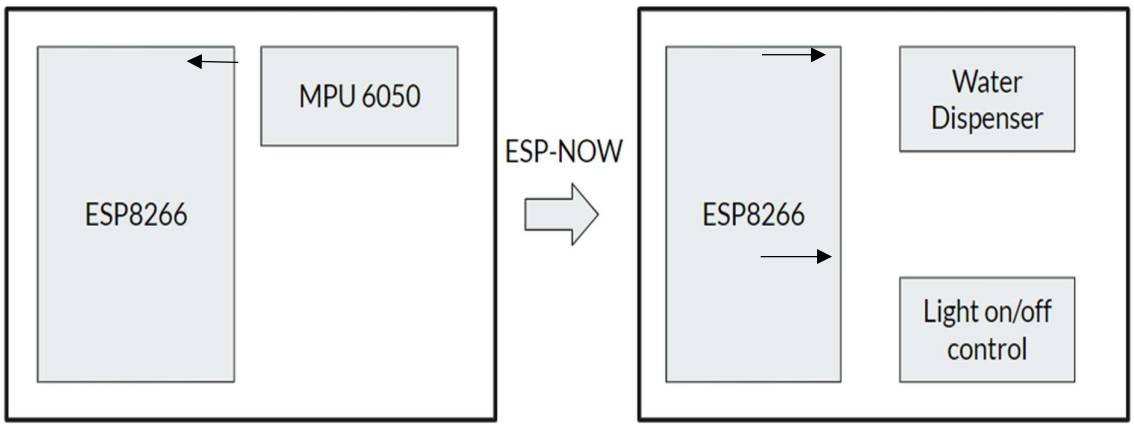


Fig 3.1 Block diagram

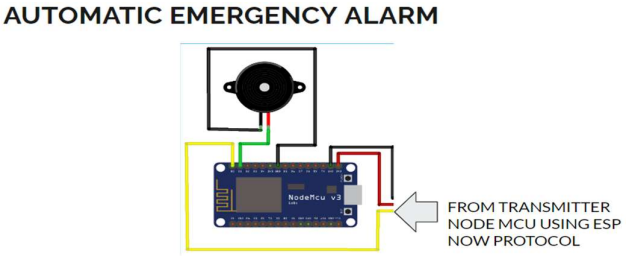
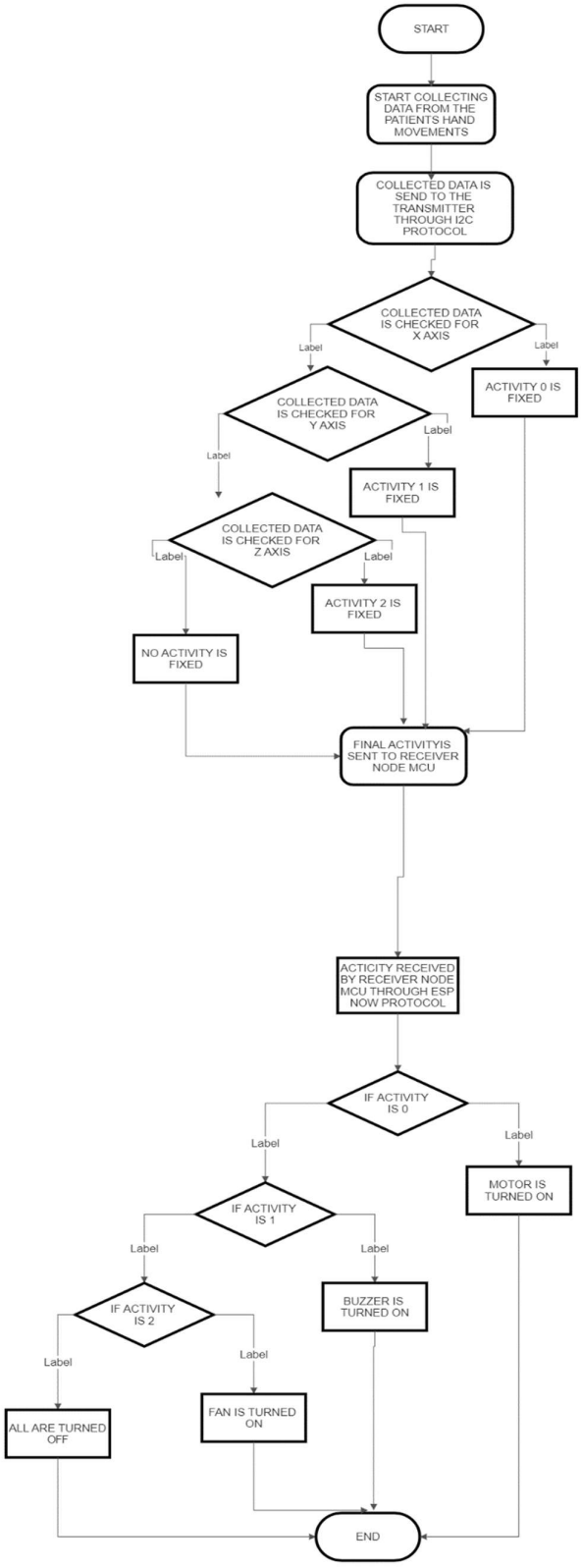


Fig 1.3 Buzzer interfacing diagram

3.3FLOW OF THE PROJECT



3.4HARDWARE

HARDWARE REQUIREMENTS:

AT THE TRANSMITTER SIDE:

1.ESP8266,(NODE MCU):

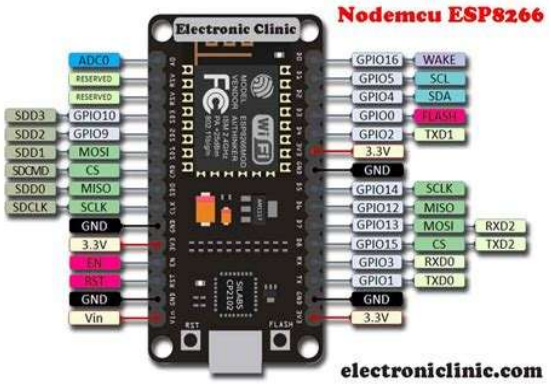


Fig 1.4 MPU 6050

3.5HARDWARE SPECIFICATIONS:

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug and Play
- PCB Antenna

2.MPU 6050:

- MEMS 3-axis accelerometer and 3-axis gyroscope values combined
- Power Supply: 3-5V
- Communication : I2C protocol
- Built-in 16-bit ADC provides high accuracy

- Built-in DMP provides high computational power
- Can be used to interface with other IIC devices like magnetometer
- Configurable IIC Address
- In-built Temperature sensor

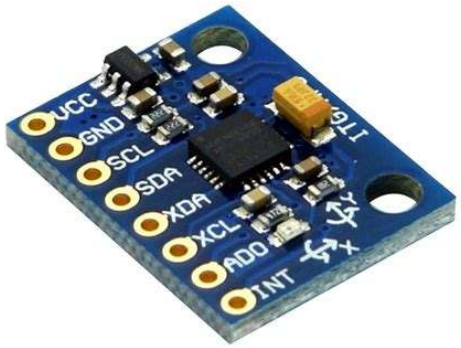
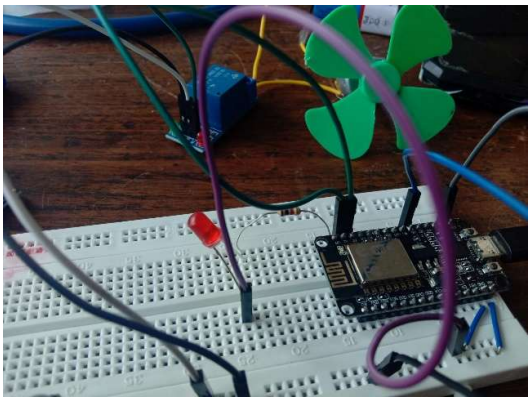


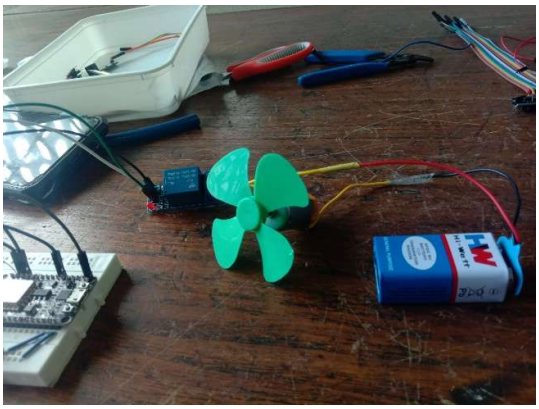
Fig 1.5 MPU 6050

AT THE RECEIVER SIDE:

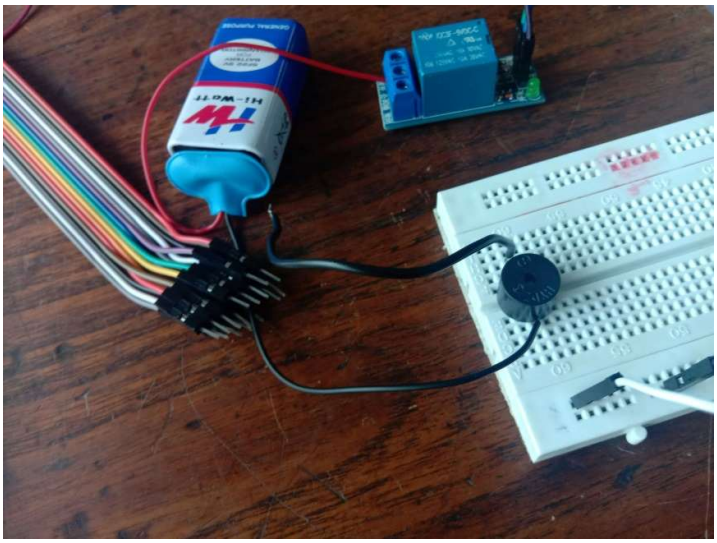
1.LED INTERFACING:



2.FAN INTERFACING:



3.BUZZER INTERFACING:



ESP-NOW PROTOCOL TECHNOLOGY:

ESP-NOW supports the following features: • Encrypted and unencrypted unicast communication; • Mixed encrypted and unencrypted peer devices. • Up to 250-byte payload can be carried; • Sending callback function that can be set to inform the application layer of transmission success or failure.	ESP-NOW technology also has the following limitations: • Limited encrypted peers. 10 encrypted peers at the most are supported in Station mode; 6 at the most in SoftAP or SoftAP + Station mode; • Multiple unencrypted peers are supported, however, their total number should be less than 20, including encrypted peers; • Payload is limited to 250 bytes.

3.6COST ANALYSIS :

S.No	Particulars	Quantity	Cost per unit	Cost
1.	ESP8266	2	464	928
2.	MPU 6050	1	205	205
	Total			1133

3.7SOFTWARE SIMULATION

SOFTWARE USED:

ARDUINO IDE is used for programming both node MCU both at the transmitter side and at the receiver side

SOFTWARE CODE AT THE TRANSMITTER SIDE:

transmitter1.ino

```
//#include <ESPPubSubClientWrapper.h>

#include <ESP8266WiFi.h>
#include <espnow.h>
#include <Adafruit_Sensor.h>
#include <PubSubClient.h>
#include <Adafruit_MPU6050.h>
#include <Wire.h>


// REPLACE WITH RECEIVER MAC Address
uint8_t broadcastAddress[] = {0x84, 0xF3, 0xEB, 0x25, 0xA9, 0x17};
// Structure example to send data
// Must match the receiver structure
typedef struct struct_message {
int activity;
} struct_message;

Adafruit_MPU6050 mpu;

float accelx;
float accely;
float accelz;
float gyrox;
float gyroy;
float gyroz;
int data;
```

```
// Create a struct_message called myData
struct_message myData;

unsigned long lastTime = 0;
unsigned long timerDelay = 2000;  // send readings timer

// Callback when data is sent
void OnDataSent(uint8_t *mac_addr, uint8_t sendStatus) {
  Serial.print("Last Packet Send Status: ");
  if (sendStatus == 0){
    Serial.println("Delivery success");
  }
  else{
    Serial.println("Delivery fail");
  }
}

void setup() {
  // Init Serial Monitor
  Serial.begin(9600);

  // Set device as a Wi-Fi Station
  WiFi.mode(WIFI_STA);

  // Init ESP-NOW
  if (esp_now_init() != 0) {
    Serial.println("Error initializing ESP-NOW");
    return;
  }
  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");
```

itter1.ino

```
    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_5_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:
```

```
    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);
  // Once ESPNow is successfully Init, we will register for Send CB to
  // get the status of Trasnmitted packet
  esp_now_set_self_role(ESP_NOW_ROLE_CONTROLLER);
  esp_now_register_send_cb(OnDataSent);

  // Register peer
  esp_now_add_peer(broadcastAddress, ESP_NOW_ROLE_SLAVE, 1, NULL, 0);
}

void loop() {
  if ((millis() - lastTime) > timerDelay) {
    // Set values to send
sensors_event_t a, g, temp;
mpu.getEvent(&a, &g, &temp);

  /* Print out the values */
  accelx=a.acceleration.x;
  accely=a.acceleration.y;
  accelz=a.acceleration.z;
```

```
accelz=a.acceleration.z;
gyrox=g.gyro.x;
gyroy=g.gyro.y;
gyroz=g.gyro.z;
 if(!isnan(accelx)&&!isnan(accely)&&!isnan(accelz)&&!isnan(gyrox)&&!isnan(gyroy)&&!isnan(gyroz)){
  Serial.print("Gyrox : ");
  Serial.print(gyrox);
  Serial.println("");
  Serial.print("Gyroy : ");
  Serial.print(gyroy);
  Serial.println("");
  Serial.print("Gyroz : ");
  Serial.print(gyroz);
 Serial.println("");
 if(gyrox>0.01)
 {
 myData.activity=4;
 }
 else if(gyrox<-0.01)
 {
 myData.activity=1;
 }
  else if(gyroy>+0.01)
 {
 myData.activity=2;
 }
 else if(gyroz<-0.01)
 {
 myData.activity=3;
 }
```

```
    }
    else
    {
     myData.activity=0;
    }
      Serial.print("Activity Detected ");
      Serial.println(myData.activity);
      Serial.println("");


    // Send message via ESP-NOW
    esp_now_send(broadcastAddress, (uint8_t *) &myData, sizeof(myData));

    lastTime = millis();
  }
}
```

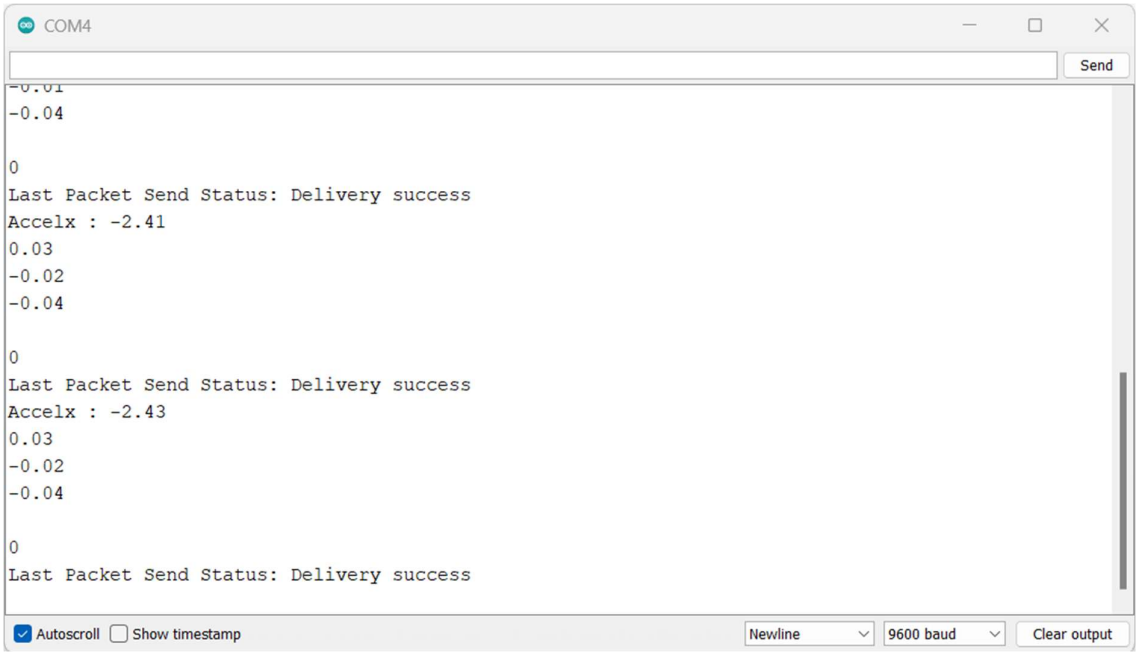
CODE AT THE RECEIVER SIDE:

```
#include <ESP8266WiFi.h>
#include <espnow.h>
 uint8_t Motor_Pin = D7;
uint8_t LED_Pin = D0;
uint8_t FAN_Pin = D2;
uint8_t BUZ_Pin = D1;
int data=0;
// Structure example to receive data
// Must match the sender structure
typedef struct struct_message {
int activity;

} struct_message;

// Create a struct_message called myData
struct_message myData;

// Callback function that will be executed when data is received
void OnDataRecv(uint8_t * mac, uint8_t *incomingData, uint8_t len) {
  memcpy(&myData, incomingData, sizeof(myData));
  Serial.print("Bytes received: ");
  Serial.println(len);
  Serial.print("Activity: ");
  Serial.println(myData.activity);
  data=myData.activity;

}

void setup() {
  // Initialize Serial Monitor
  Serial.begin(9600);

  // Set device as a Wi-Fi Station
  WiFi.mode(WIFI_STA);

  // Init ESP-NOW
  if (esp_now_init() != 0) {
    Serial.println("Error initializing ESP-NOW");
    return;
  }

  // Once ESPNow is successfully Init, we will register for recv CB to
  // get recv packer info
  esp_now_set_self_role(ESP_NOW_ROLE_SLAVE);
  esp_now_register_recv_cb(OnDataRecv);
  pinMode(Motor_Pin,OUTPUT);
  pinMode(LED_Pin,OUTPUT);
  pinMode(FAN_Pin,OUTPUT);
  pinMode(BUZ_Pin,OUTPUT);

}

void loop() {
  //myData.activity==3;

  if(data==1)
  {
    digitalWrite(Motor_Pin,HIGH);
    delay(6000);
    digitalWrite(Motor_Pin,LOW);
  }
  else if(data==2)
  {
    digitalWrite(LED_Pin,HIGH);
    delay(6000);
    digitalWrite(LED_Pin,LOW);
  }
  else if(data==3)
  {
    digitalWrite(FAN_Pin,HIGH);
    delay(6000);
    digitalWrite(FAN_Pin,LOW);
  }
  else if(data==4)
  {
    digitalWrite(BUZ_Pin,HIGH);
    delay(6000);
    digitalWrite(BUZ_Pin,LOW);
  }
  else
  {
    digitalWrite(Motor_Pin,LOW);
     digitalWrite(LED_Pin,LOW);
      digitalWrite(FAN_Pin,LOW);
      digitalWrite(BUZ_Pin,LOW);
  }
}
```

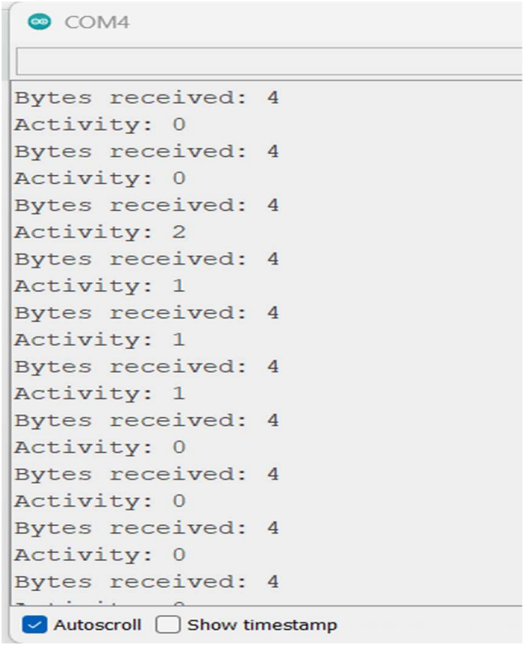
CHAPTER:4

RESULT ANALYSIS

AT THE TRANSMITTER SIDE:



AT THE RECEIVER SIDE:

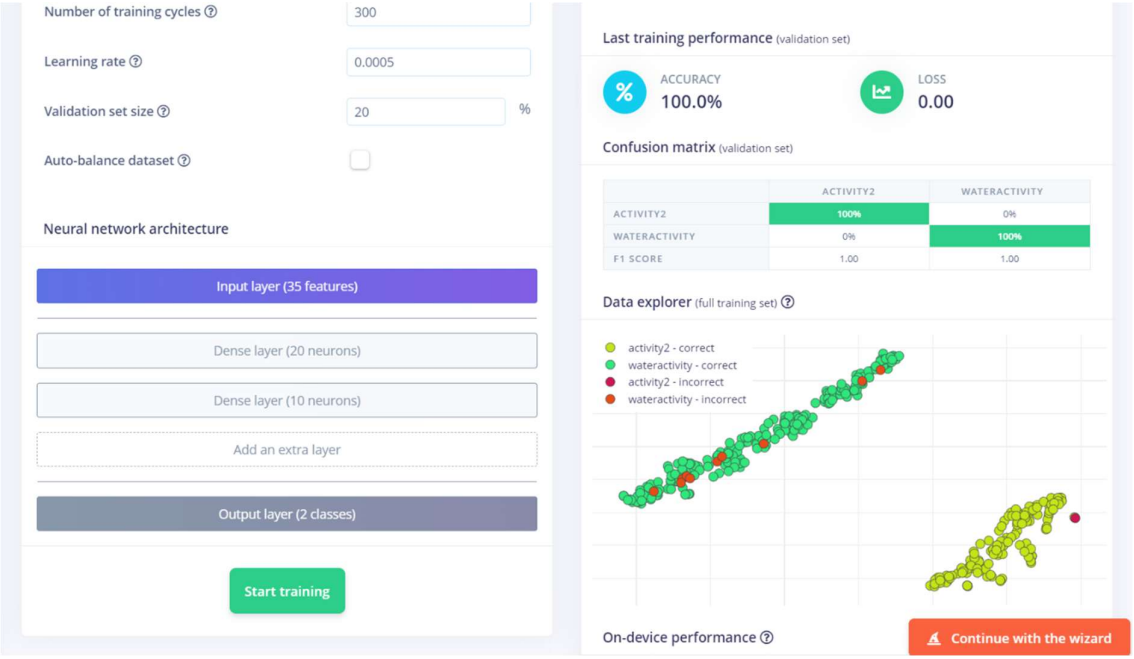


CHAPTER:5

CONCLUSION AND FUTURE WORKS

- **SIMULATION:**

TRAINING THE DATA USING EDGE IMPULSE:



- Open source website, EDGE IMPULSE, was used to classify the activities based on collected data set .
- K-means Clustering algorithm was employed to train the neural network
- Range of gyro values for different activities was found.

CONCLUSION:

Thus,the developed device will provide assistance to the bed-ridden individuals aged people in their day-to-day operation of the applications present in their surroundings thus increasing the level of comfort.

REFERENCES

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- **AUTHOR NAME:** Veekshita R , Meghana , Varsha Iyengar G, Thejaswini B R, Latha ,Students, BE, Department of TCE, GSSSIETW, Mysuru, Karnataka, India,2Assistant Professor, Department of TCE, GSSSIETW, Mysuru, Karnataka, India
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