VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

INTERNET OF THINGS LAB

Submitted by

SHIVANI SATHYANARAYANAN(1BM21CS203)

in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING

B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019
JUN-2023 to SEP-2023

B. M. S. College of Engineering,
Bull Temple Road, Bangalore 560019
(Affiliated To Visvesvaraya Technological University, Belgaum)
Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "Internet Of Things Lab" carried out by **DHIVANI SATHYANARAYANAN(1BM21CS203),** who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2023. The Lab report has been approved as it satisfies the academic requirements in respect of a **Internet of things lab - (22CS5PCIOT)** work prescribed for the said degree.

Sowmya T   **Dr. Jyothi S Nayak**

Assistant professor   Professor and Head
Department of CSE   Department of CSE
BMSCE, Bengaluru   BMSCE, Bengaluru

`

INDEX

1. LED Blinking

Aim:

Turns on an LED on for one second, then off for one second, repeatedly.

Hardware Required:
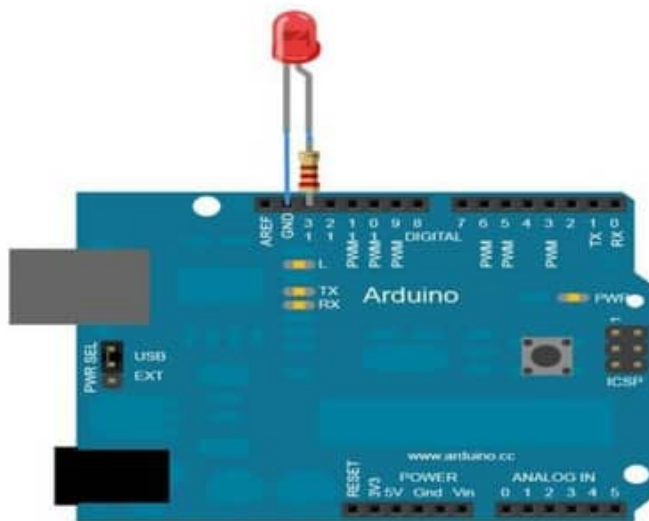
• Arduino Board

• LED

Circuit diagram:

Fig.1.LED blinking

Handwritten code pic:

Blinking of LED

```
/* BLINK
Turns on LED for one second and then off for
one second. This code is in public domain */

void setup()
{
// Initialize dig pin as O/P
// Pin 13 has LED connected on
// most arduino boards
    pinMode (13, OUTPUT);
}
void loop()
{
digitalWrite (13, HIGH);
delay(1000);
digitalWrite (13, LOW);
delay (1000);
}
```

Code:

```
int led = 13;

void setup()

{

pinMode(led, OUTPUT);

}

void loop() {

digitalWrite(led, HIGH);

delay(1000);

digitalWrite(led, LOW);

delay(1000);

}
```

Observation:

The code establishes a basic program to toggle an LED on and off in one-second intervals. Pin 13 is configured as the output for the LED, and the main loop continuously switches the LED on for one second, then off for another second.

2. LED ON/OFF Using Pushbutton

Aim:

Turn an LED ON /OFF using a Pushbutton.

Hardware Required:

• Arduino Board

• LED

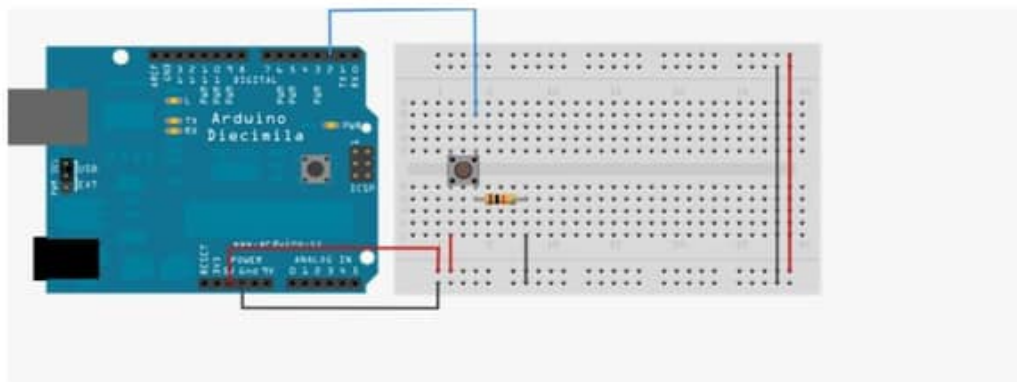• Push button

Circuit diagram:

Fig.2.LED on/off using pushbutton

Handwritten code pic:

Operating LED using button

```
const int buttonPin = 2;
const int ledPin = 13;
int buttonState = 0;
void setup ()
{
    pinMode (ledPin, OUTPUT);
    pinMode (buttonPin, INPUT);
}
void loop ()
{
    buttonState = digitalRead (buttonPin);
    if (buttonState == HIGH)
    {
        digitalWrite (ledPin, HIGH);
    }
    else
    {
        digitalWrite (ledPin, LOW);
    }
}
```

Code:

const int buttonPin = 2;

```
const int ledPin = 13;

int buttonState = 0;

void setup() {

 pinMode(ledPin, OUTPUT);

 pinMode(buttonPin, INPUT);   }

void loop() {

 buttonState = digitalRead(buttonPin);

 if (buttonState == HIGH) {

   digitalWrite(ledPin, HIGH);

 } else {

   digitalWrite(ledPin, LOW);

 } }
```

Observation:

The code achieves desired functionality of turning the LED on and off based on the state of the push button. When the button is pressed, the LED lights up. This interactive behavior enhances the user experience, where the LED state is directly controlled by the push button's input.

3. LED Fading using Potentiometer

Aim:

To control the brightness of an LED using a Potentiometer.

Hardware Required:

• Arduino Board

• LED

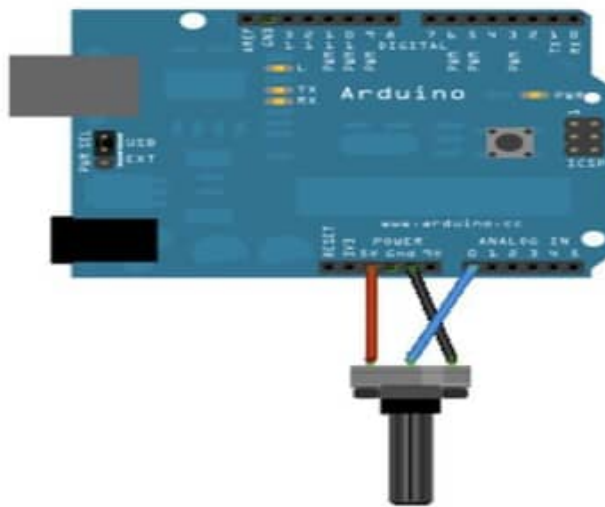• Potentiometer

Circuit diagram:

Fig.3-LED fading using potentiometer

Handwritten code pic:

LED Fading using Potentiometer

Aim : To control the brightness of an Ud using
a potentiometer.

Hardware : Arduino board, LED, Potentiometer.

Code :

```
const int analogInPin = A0;
const int analogOutPin = 11;

int serialValue = 0;
int outputValue = 0;

void setup()
{
    Serial.begin(9600);
}

void loop()
{
    sensorValue = analogRead(analogInPin);
    outputValue = map(sensorValue, 0, 1023, 0, 255);
    Serial.print(sensorValue);
    Serial.println(outputValue);
    delay(2);
}
```

11

Code:

```
const int potPin = A0;
const int ledPin = 9;
void setup() {
  pinMode(ledPin, OUTPUT);
}
void loop() {
  int potValue = analogRead(potPin);
  int brightness = map(potValue, 0, 1023, 0, 255);
  analogWrite(ledPin, brightness);
}
```

Observation:

The code effectively achieves the desired outcome, enabling the dynamic control of the LED's brightness through the potentiometer. As the potentiometer is adjusted, the analogRead function captures its varying values (ranging from 0 to 1023). The mapping of these values to a brightness scale (0 to 255) results in adjustment of the LED's intensity.

4. Nightlight Simulation

Aim:

Simulating a night light using LDR and PIR

Hardware Required:

• 1 LED

• 1 LDR

• 110K resistor

Connection:

1. Attach one leg of LDR to 5V and another leg to Arduino Analog pin A0

2. Attach one leg of 110K resistor with that leg of LDR connected to A0

3. Attach another leg of resistor to the ground

4. Connect the positive leg of LED to pin 11 and negative to GND
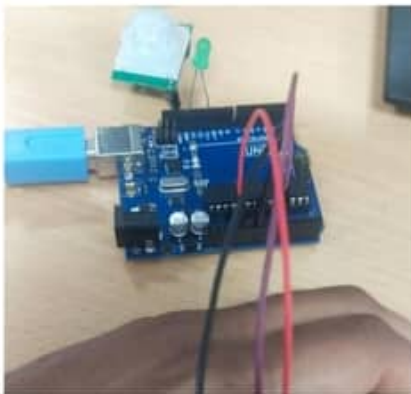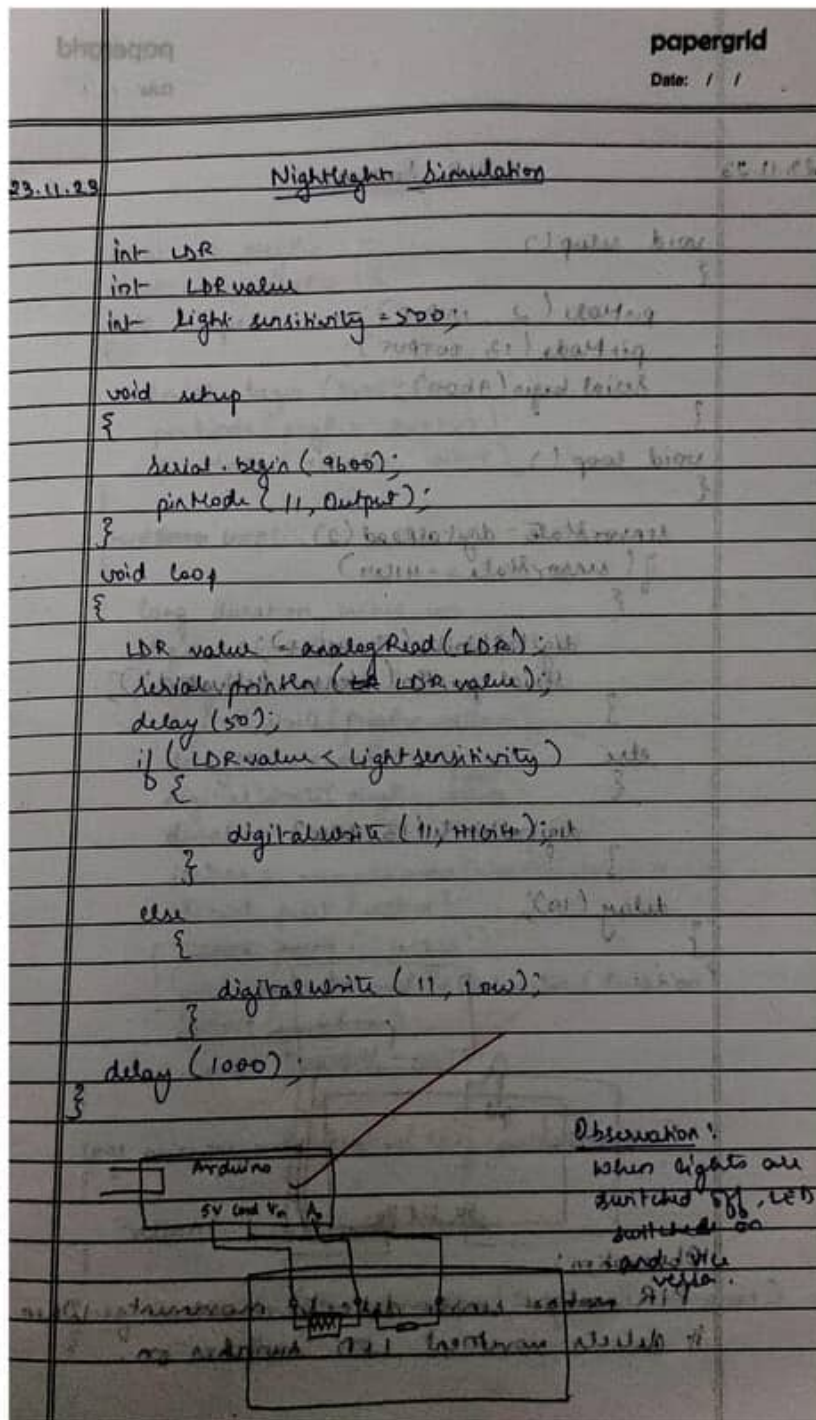
Circuit diagram:

Fig 4.1- when it is bright, the LED is off.

Fig 4.2- when dark, the LED turns on.

Handwritten code pic:

Code:

```
int LDR = 0;

int LDRValue = 0;

int light_sensitivity = 500;
```

```
void setup()

{

Serial.begin(9600);

pinMode(11, OUTPUT);

}

void loop()

{

LDRValue = analogRead(LDR);

Serial.println(LDRValue);

delay(50);

if (LDRValue < light_sensitivity)

{

digitalWrite(11, HIGH);

}

else

{

digitalWrite(11, LOW);

}

delay(1000);

}
```

Observation:

The code successfully achieves the goal of simulating a night light based on the ambient light levels detected by the LDR. The analogRead function captures the LDR values, which are printed to the serial monitor for monitoring. The conditional statement compares these values to a light sensitivity threshold, and if the ambient light falls below this threshold, the LED is turned on, simulating a night light.

5. PIR with Arduino UNO

Aim: To detect the presence of human.

Hardware Required:

• 1 LED

• 1 PIR

• Arduino UNO

Circuit diagram:
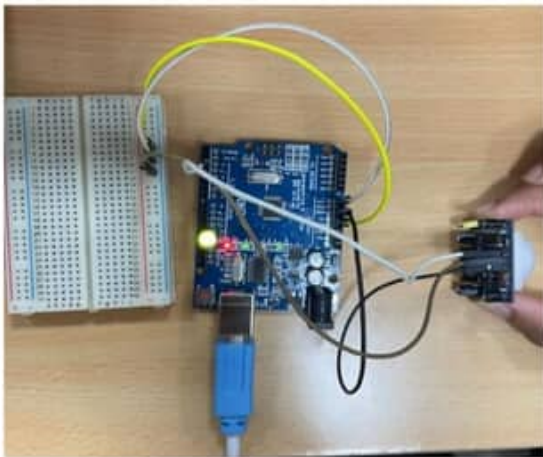

Fig 5- When motion is detected LED is high

Handwritten code pic:

23.11.23

PIR Sensors

```
void setup ()
{
    pinMode (2, INPUT);
    pinMode (13, OUTPUT);
    Serial.begin (9600);
}

void loop ()
{
    sensorState = digitalRead (2);
    if (sensorState == HIGH)
    {

        digitalWrite (13, HIGH);
        Serial.println ("Sensor Activated");
    }

    else
    {

        digitalWrite (13, LOW)
    }
    delay (10)
}
```


5V Gnd Vin
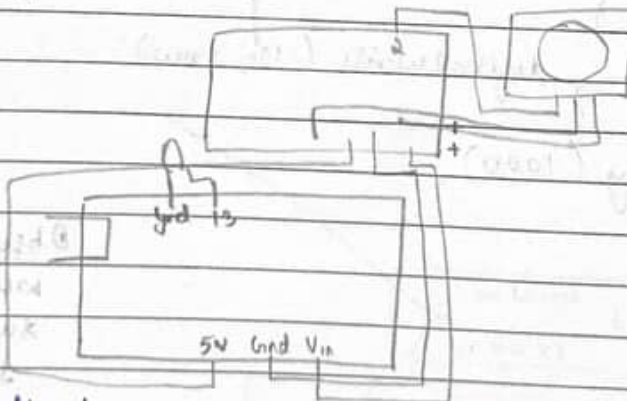
Observation:
PIR motion sensor detects movement. When it detects movement LED switches on.

Code:

```
int sensorState = 0;

void setup()

{

pinMode(2, INPUT);

pinMode(13, OUTPUT);

Serial.begin(9600); }

void loop()

{

sensorState = digitalRead(2);

if (sensorState == HIGH) {

digitalWrite(13, HIGH);

Serial.println("Sensor activated!");

} else {

digitalWrite(13, LOW);

}

delay(10); }
```

Observation:

 The code effectively utilizes the PIR sensor to detect motion and responds by controlling the state of the LED. When motion is detected, the LED is illuminated, and a message is printed to the serial monitor.

6. Ultrasound with Arduino UNO

Aim: To detect the distance of an object.

Hardware Required:

• Ultrasonic sensor

• jumper wires(female to male)
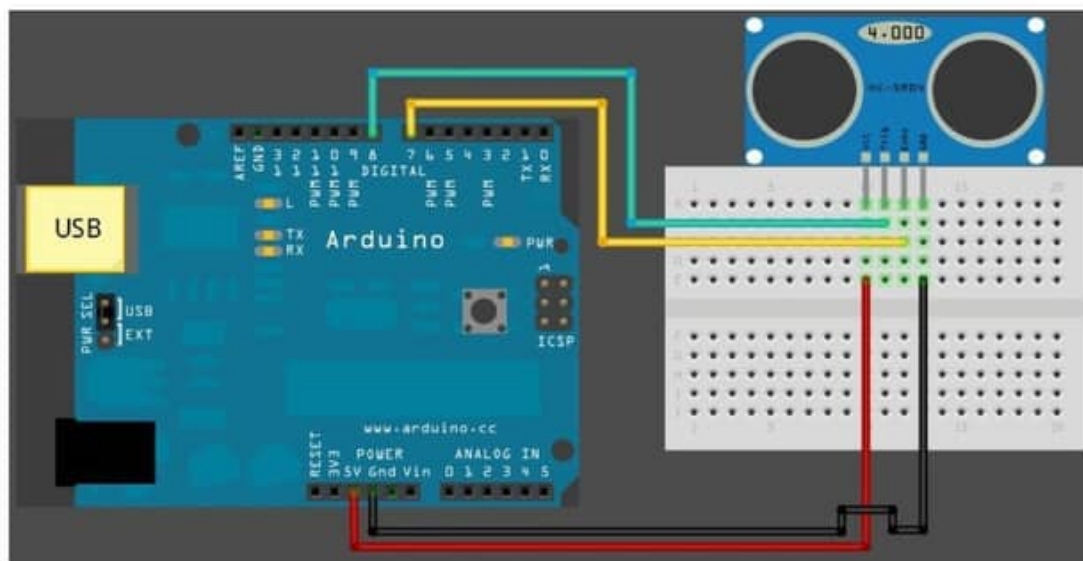
• Arduino UNO

Circuit diagram:

Fig 6-measures the distance of nearest object.

Handwritten code pic:

23.11.23

ULTRASOUND

```
const int pingPin = 7
const int echoPin = 6
void setup()
{
    serial.begin (9600);
    pinMode (pingPin, OUTPUT);
    pinMode (echoPin, INPUT);
}

void loop()
{
    long duration, inches, cm;
    digitalWrite (pingPin, LOW);
    delayMicroseconds (2);
    digitalWrite (pingPin, HIGH);
    delayMicroseconds (10);
    digitalWrite (pingPin, LOW);
    duration = pulseIn (echoPin, HIGH);
    inches = microsecondsToInches (duration);
    serial.print (inches);
    serial.print ("inches");
    cm = microsecondsToCentimeters (duration);
    serial.print (cm);
    serial.printer ("cm");
}
long microsecondsToInches (long microseconds)
{
    return microseconds/74/2;
}
long microsecondsToCentimeters (long microseconds)
{
```

return microseconds / 29 / 2 ;
}

sensor

Vcc Trg Echo Gnd

7 6

Arduino UNO

5 V Gnd

Observation:
Ultrasound sensor measure distance by sending
and receiving ultrasonic waves.

Code:

```
const int pingPin = 7;

const int echoPin=6;

void setup()

{

Serial.begin(9600);

pinMode(pingPin, OUTPUT);

pinMode(echoPin, INPUT);

}

void loop()
```
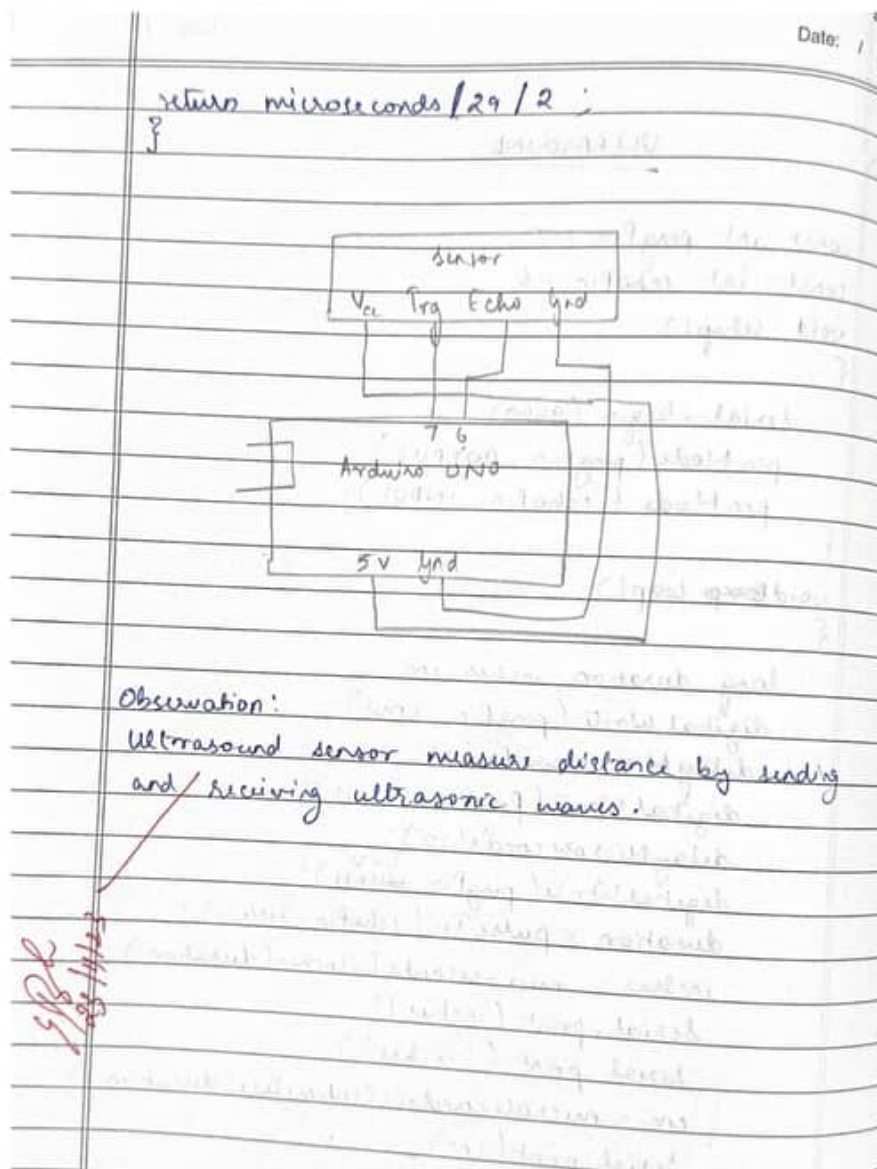
```
{
long duration, inches, cm;
digitalWrite(pingPin, LOW);
delayMicroseconds(2);
digitalWrite(pingPin, HIGH);
delayMicroseconds(10);
digitalWrite(pingPin, LOW);
duration = pulseIn(echoPin, HIGH);
inches = microsecondsToInches(duration);
Serial.print(inches);
Serial.print("inches");
cm = microsecondsToCentimeters(duration);
Serial.print(cm);
Serial.println("cm");
}
long microsecondsToInches(long microseconds)
{
return microseconds / 74 / 2; }
long microsecondsToCentimeters(long microseconds)
{ return microseconds / 29 / 2;
}
```

Observation:

The code effectively utilizes the ultrasonic sensor to measure distance and provides readings in both inches and centimeters. In the loop, a pulse is generated by triggering the ultrasonic sensor, and the duration of the pulse is measured using the pulseIn() function.

7. Fire Alert

Aim:

Fire alarm simulation.

Hardware Required:

- Flame sensor (Analogue Output)
- Arduino
- Bread board
- LED
- Buzzer
- Connecting wires

Connections:

Flame sensor interfacing to Arduino

Flame sensor to Arduino

vcc to vcc

gnd to gnd

A0 to A0

Led interfacing to Arduino

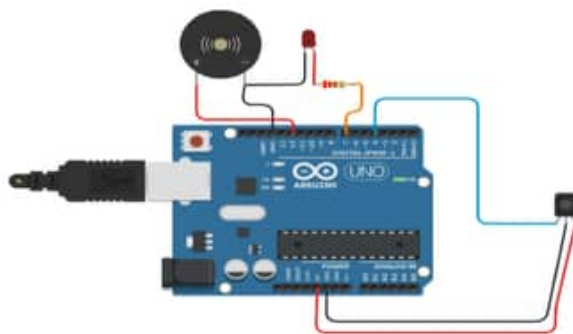LED +ve is connected to 9th pin of Arduino

LED -ve is connected to gnd pin of arduino

Buzzer interfacing to Arduino

Buzzer +ve is connected to 12th pin of Arduino

Buzzer -ve is connected to GND pin of Arduino

Circuit diagram:
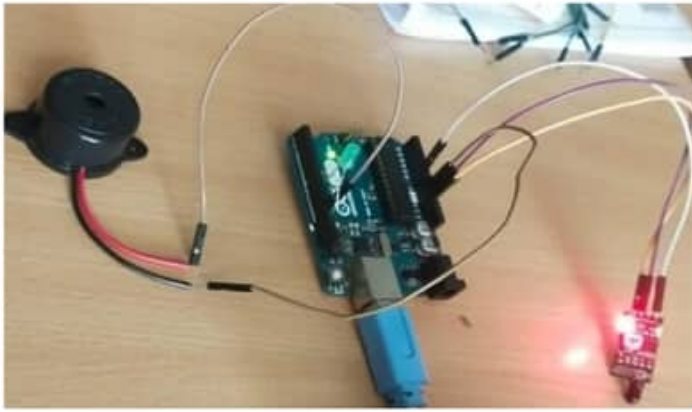
Fig 7- When the fire is detected LED turns on.

Handwritten code pic:

FIRE ALERT

Code:

```
int sensorPin = A0;
int sensorValue = 0;
int led = 9;
int buzzer = 12;
void setup()
{
  pinMode (Led, OUTPUT);
  pinMode (Buzzer, OUTPUT);
  Serial.begin (9600);
}

void loop()
{
  sensorValue = analogRead (sensorPin);
  Serial.begin (9600);
}

void loop ()
{
  sensorValue = analogRead (sensorPin);
  Serial.println (sensorValue);
  if (sensorValue < 100)
  {
    Serial.println ("Fire Detected");
    Serial.println ("LED on");
    digitalWrite (led, HIGH);
    digitalWrite (buzzer, HIGH);
    delay (1000 sensorValue);
  }
  digitalWrite (led, LOW);
  digitalWrite (buzzer, LOW);
```

return microseconds/29/2;
delay (sensor Value);

Buzzer   LED

Flame
sensor:

12   9

5V   GND   A0

Observation :
When fire is detected, buzzer turns on. GLED

Code:

int sensorPin = A0; // select the input pin for the LDR

```
int sensorValue = 0; // variable to store the value coming from the sensor

int led = 9; // Output pin for LED

int buzzer = 12; // Output pin for Buzzer

void setup() {

pinMode(led, OUTPUT);

pinMode(buzzer,OUTPUT);

Serial.begin(9600);

}

void loop()

{

sensorValue = analogRead(sensorPin);

Serial.println(sensorValue);

if (sensorValue < 100)

{

Serial.println("Fire Detected");

Serial.println("LED on");

digitalWrite(led,HIGH);

digitalWrite(buzzer,HIGH);

delay(1000);

}

digitalWrite(led,LOW);

digitalWrite(buzzer,LOW);

delay(sensorValue);

}
```
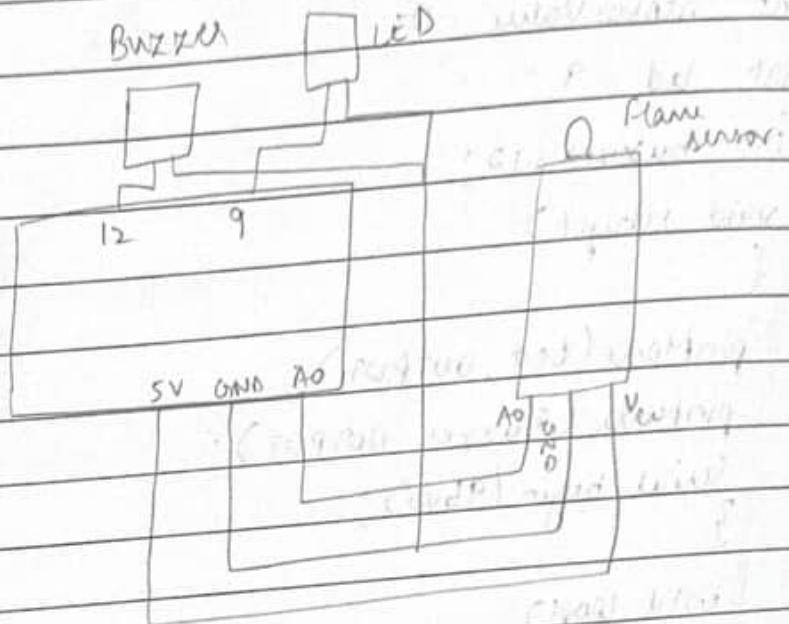
Observation:

The code effectively simulates a fire alarm by monitoring the analog output of the flame sensor. When the sensor value falls below a predefined threshold (100 in this case), indicating the detection of a flame, the LED and buzzer are activated, and the corresponding messages are printed to the serial monitor.

8. Automatic irrigation controller simulation

Aim:

Sensing the soil moisture and sprinkling the Water simulation.

Hardware Required:

- Arduino
- Moisture Sensor
- Breadboard
- Min servo motor

Connections:

Moisture sensor VCC to Arduino 5V

Moisture sensor GND to Arduino GND

Moisture sensor A0 to Arduino A0

Servo motor VCC to Arduino 5V

Servo motor GND to Arduino GND

Servo Motor Signal to Arduino digital pin 9

Circuit diagram:
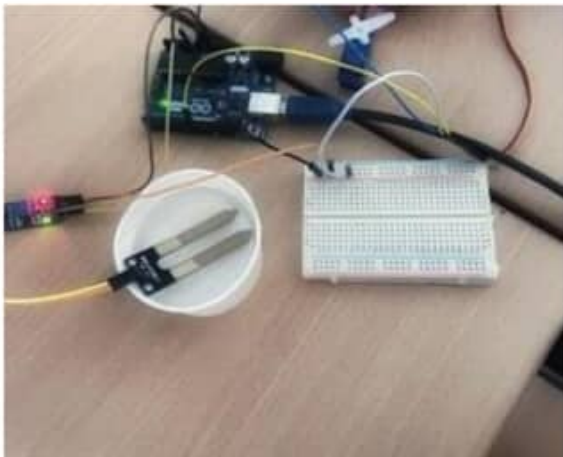
Fig 8- When moisture detected LED High, else Servo motor is on.

Handwritten code pic:

AUTOMATIC IRRIGATION CONTROLLER
SIMULATION

Code:

```
#include <servo.h>
Servo myservo;
int pos = 0;

int sensorPin = A0;
int sensorValue = 0;
void setup()
{
  myservo.attach(9);
  serial.begin(9600);
}

void loop()
{
sensorValue = analogRead(sensorPin);
serial.println(sensorPin, Value);
if (sensorValue > 500)
{
    for (pos = 0; pos <= 180; pos += 1)
    {
        myservo.write(pos);
        delay(15);
    }
    for (pos = 180; pos >= 0; pos -= 1)
    {
        myservo.write(pos);
        delay(15); } }
    delay(1000);
}
```
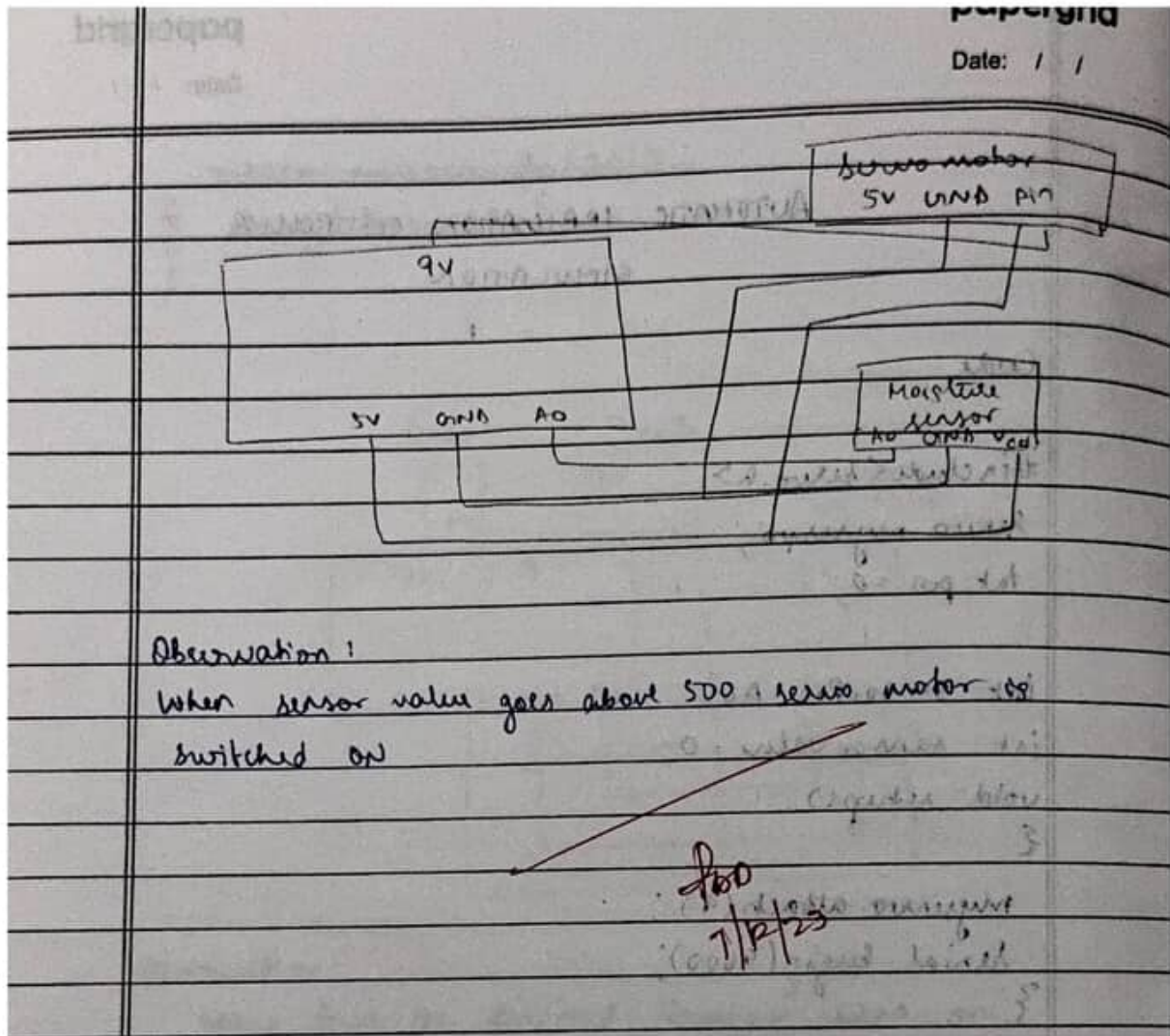
Observation !

When sensor value goes about 500 , servo motor is switched on

Code:

```
#include <Servo.h>;
Servo myservo;
int pos = 0;
int sensorPin = A0;
int sensorValue = 0;
void setup() {
myservo.attach(9);
Serial.begin(9600);
}
void loop()
```

```
{
sensorValue = analogRead(sensorPin);

Serial.println (sensorValue);

if(sensorValue<500)

{
for (pos = 0; pos < 180; pos += 1)

{ // goes from 0 degrees to 180 degrees

myservo.write(pos);

delay(15); // waits 15ms for the servo to reach the position

}
for (pos = 180; pos < 0; pos -= 1)

{ // goes from 180 degrees to 0 degrees

myservo.write(pos);

delay(15); // waits 15ms for the servo to reach the position

}
}
delay (1000);

}
```

Observation:

The code simulates an automatic irrigation controller by utilizing a moisture sensor to monitor soil moisture levels. When the moisture level drops below the defined threshold, the servo motor moves to simulate the activation of a sprinkler system.

9. Reading the code present on RFID tag

Aim:

The following code will read the code present on RFID tag and print it in serial monitor.

Connection:

5V-Arduino 5V

GND-Arduino GND

Tx-pin 9

Circuit diagram:

Code:

```
#include<SoftwareSerial.h>;
SoftwareSerial mySerial(9, 10);
int count = 0;                           // count = 0
char input[12];                          // character array of size 12
boolean flag = 0;                        // flag =0
void setup()
{
  Serial.begin(9600);                    // begin serial port with baud rate 9600bps
  mySerial.begin(9600); }
void loop()
{   if(mySerial.available())
```

```
  {  count = 0;

    while(mySerial.available() && count < 12)

    {

      input[count] =mySerial.read();

      count++;

      delay(5);   }

    Serial.print(input);

}}
```

Observation:

The output in the serial monitor is the RFID tag number, and it allows for real-time monitoring and verification of the data read from the RFID tag.

10. Access control through RFID

Aim:

The following code will read the code present on RFID tag tapped. If the code matches with the previously known tag (configured in the code), it will grant access (here LED will glow), otherwise access will be denied.

Connection:

5V-Arduino 5V

GND-Arduino GND

Tx-pin 9

Led-pin 12

Circuit diagram:
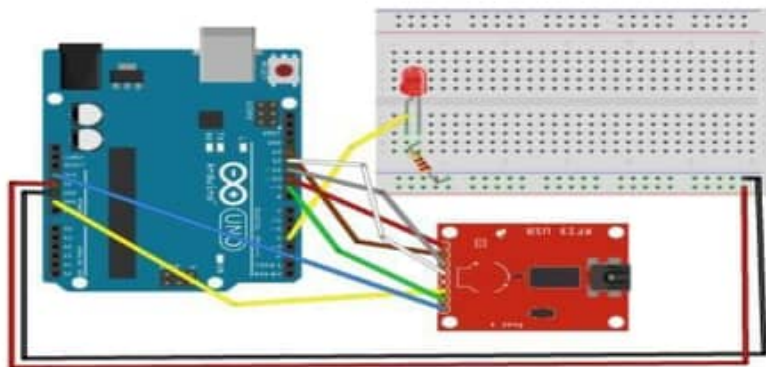
Fig.10.Access control through RFID

Handwritten code pic:

WEEK - 4 - RFID

1. Reading the code present on RFID Tag

Code:

```
#include <software serial.h>
software serial myserial (9,10);
int count = 0;
char input [12];
boolean flag = 0;
void setup ()
{
    serial begin (9600);
    myserial . Begin (9600);
}

void loop ()
{

    if (myserial. available ())
    {
        count = 0;
        while (myserial. available () && count < 12)
        input array
        {
            input [count] = myserial. read ();
            count ++;
            delay [5];
        }
        serial . print (input);
    }
}
```

5V - Arduino 5v
GND - Arduino GND
Tx - ping
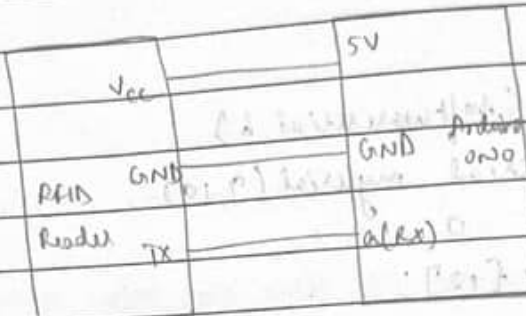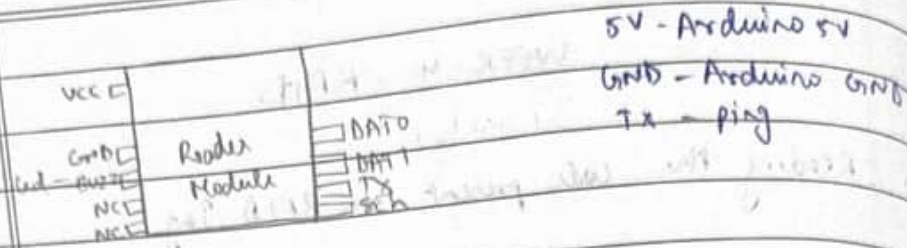
Outcome : It will read the code present on RFID
tag & print it in serial monitor
09 : 34 : 32 . 284 → 510093E02A08

2. Access Control through RFID

Code :
```
#include<SoftwareSerial.h>
Softwareserial myserial(9,10);
#define LEDPIN 12
char tag ="510093E02A08";
char input [12];
int count = 0;
boolean flag=0;
void setup()
{
    Serial.begin(9600);
    myserial.begin(9600);
    pinMode(LEDPIN,OUTPUT);
}
```

```
void loop()
{
    if (myserial.available())
    {
        count = 0;
        while (myserial.available() && count < 12)
        {
            input[count] = myserial.read();
            serial.write(input[count]);
            count++;
            delay(50);
        }
        if (count == 12)
        {
            count = 0;
            flag = 1;
            while(count < 12 && flag != 0)
            {
                if (input[count] == tag[count])
                    flag = 1;
                else
                    flag = 0;
                count++;
            }
        }
        if (flag == 1)
        {
            serial.println("Access Allowed");
            digitalWrite(LEDPIN, HIGH);
            delay(2000);
            digitalWrite(LEDPIN, LOW);
        }
        else
```

```
        {
        Serial.println ("Access Denied");
        digitalWrite (LEPPIN, LOW);
        delay (2000);
        }
    }
}
```

Outcome:

09:40:35:45 → 5100932EV2A08   Access Allowed

Code matches with previously known tag.

Code:

```
#include<SoftwareSerial.h>;

SoftwareSerial mySerial(9, 10);

#define LEDPIN 12

char tag[] ="5300292DD087;" // Replace with your own Tag ID

char input[12]; // A variable to store the Tag ID being presented

int count = 0; // A counter variable to navigate through the input[] character array

boolean flag = 0; // A variable to store the Tag match status

void setup()

{

Serial.begin(9600);
```

```
mySerial.begin(9600);

pinMode(LEDPIN,OUTPUT);  }

void loop()

{

if(mySerial.available())

{    count = 0;

while(mySerial.available() && count < 12)

{

input[count] = mySerial.read();

count++; // increment counter

delay(5);

   }

if(count == 12)

 {

count =0; // reset counter varibale to 0

flag = 1;

while(count<12 && flag !=0)

{

if(input[count]==tag[count])

flag = 1;

else

flag=0;

count++; // increment i   }}

if(flag == 1) // If flag variable is 1, then it means the tags match

{

Serial.println("Access Allowed!");

digitalWrite(LEDPIN,HIGH);

delay (2000);
```

```
digitalWrite (LEDPIN,LOW); }

else

{

Serial.println("Access Denied"); // Incorrect Tag Message

digitalWrite(LEDPIN,LOW);

delay(2000);    }

for(count=0; count<12; count++)

{

input[count]= 'F' ;

}

count = 0; // Reset counter variable

}

 }
```

Observation:

Upon tapping an RFID tag, the code reads the tag's code and compares it with the predefined tag (tag[]). If the codes match, access is granted, and the LED indicator lights up for a brief period. If there is no match, access is denied, and the LED remains off.

11. HC-05 Bluetooth at Command prompt
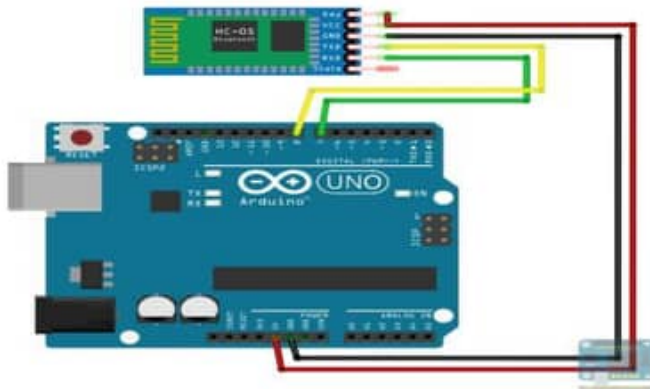
Aim :

The following code will help establish communication between arduino board and HC-05 Bluetooth module

Hardware Required :
- HC-05 Bluetooth module
- Arduino uno
- Jumper wires

Connections:

1.Vcc of Bluetooth to 5v of arduino

2.GND of Bluetooth to Ground of arduino

3. TXD of Bluetooth to Rx of arduino

4. RXD of Bluetooth to Tx of arduino

Handwritten code pic:

11.1.24

BLUETOOTH

Client code HC-05 at Command Prompt.

```
#include <SoftwareSerial.h>
SoftwareSerial BTSerial (10,11);
void setup()
{
    Serial.begin (9600);
    Serial.println ("Enter AT commands: ");
    BTSerial.begin (38400)
}

void loop ()
{
    if (BTSerial.available())
        Serial.write (BTSerial.read());
    if (Serial.available())
        BTSerial.write (Serial.read());
}
```

HC-05 controlled by mobile

```
#define ledPin 13
int state = 0;
void setup ()
{
    pinMode (ledPin, OUTPUT);
    digitalWrite (ledPin, LOW);
    Serial.begin (38400)
}
void loop ()
```

Code:

(For this program to work, HC-05 must be in command mode)

```
#include <SoftwareSerial.h>;

SoftwareSerial BTSerial(10, 11); // RX | TX

void setup()
{
  Serial.begin(9600);

  Serial.println("Enter AT commands:');

  BTSerial.begin(38400);  // HC-05 default speed in AT command more
}

void loop ()
{
  if (BTSerial.available())

    Serial.write(BTSerial.read());

  if (Serial.available())

    BTSerial.write(Serial.read()); }
```

12. HC-05 Controlled by mobile

Aim :

To control an LED using a Bluetooth module (such as HC-05) in data mode, with commands sent from an Arduino Bluetooth app

Hardware Required :

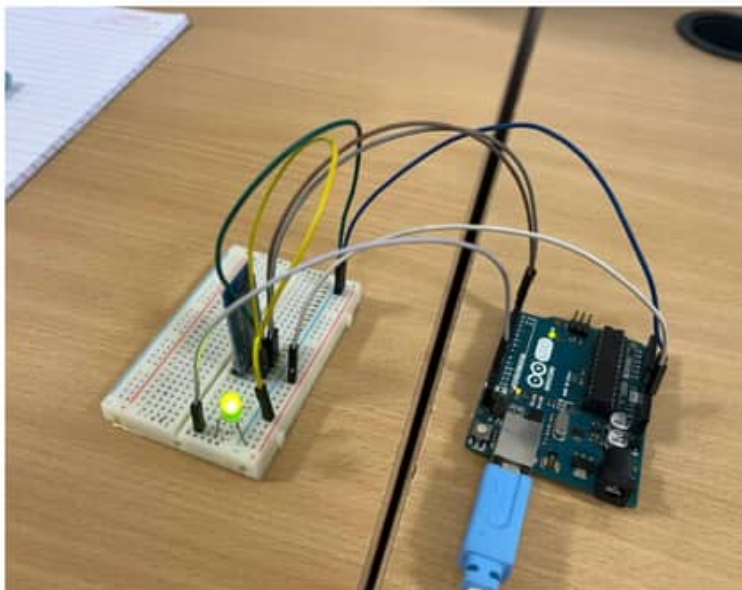- HC-05 Bluetooth module
- Led
- Arduino uno
- Jumper wires

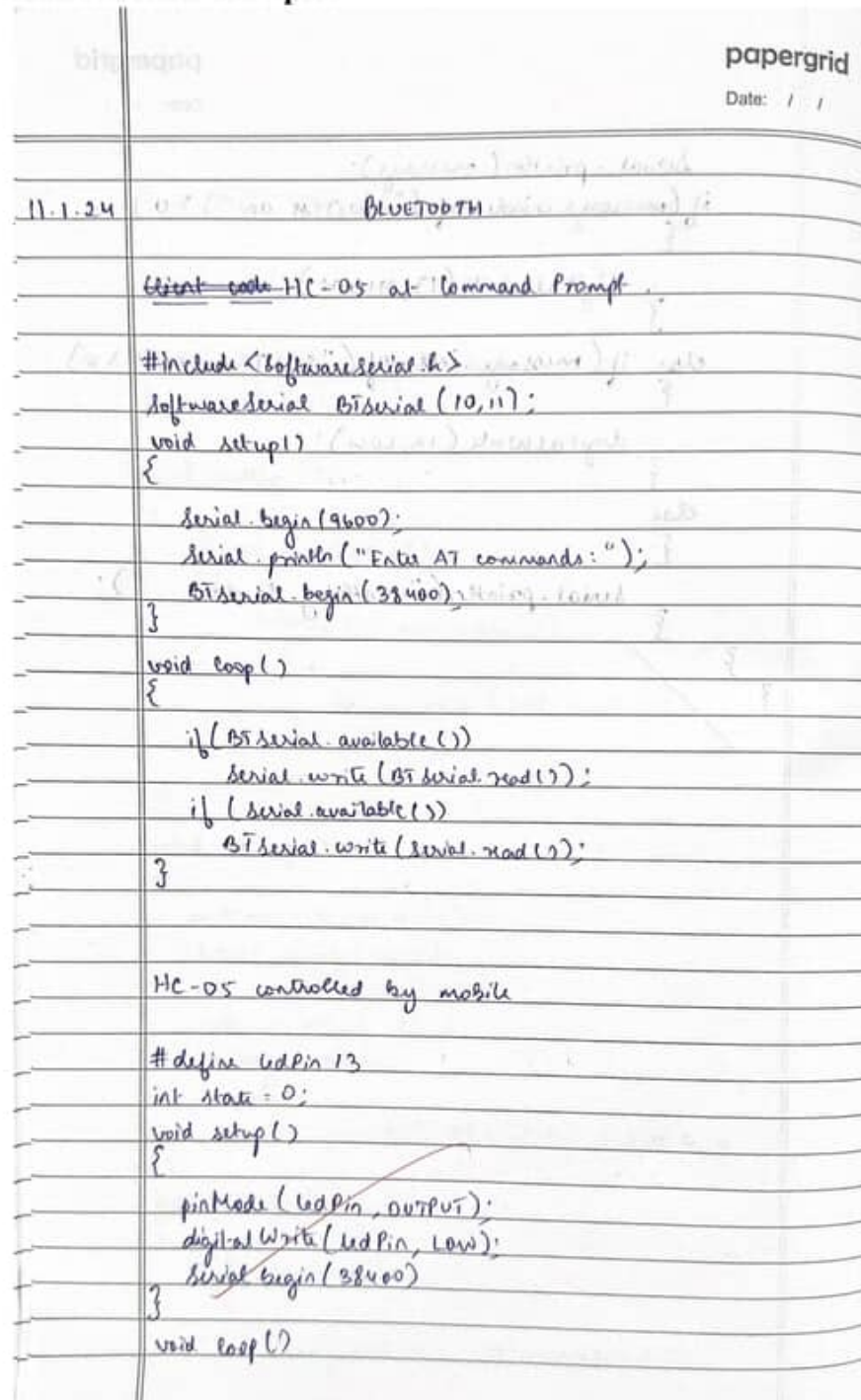**Connection:**

1.Bluetooth Module (HC-05) to Arduino:

- Connect the TX pin of the HC-05 module to a digital pin on the Arduino (e.g., pin 2).
- Connect the RX pin of the HC-05 module to a digital pin on the Arduino (e.g., pin 3).
- Connect the VCC pin of the HC-05 module to the 5V pin on the Arduino.
- Connect the GND pin of the HC-05 module to the GND pin on the Arduino.

2.LED to Arduino:

- Connect the anode (longer lead) of the LED to the digital pin 13
- Connect the cathode (shorter lead) of the LED to a current-limiting resistor
- Connect the other end of the resistor to the GND pin on the Arduino.

Handwritten code pic:

11.1.24   BLUETOOTH

Client code HC-05 at Command Prompt.

```
#Include <software serial.h>
softwareSerial BTserial (10,11);
void setup()
{
    Serial.begin (9600);
    Serial.println ("Enter AT commands:");
    BTserial.begin (38400);
}

void loop()
{
    if (BTserial.available())
        Serial.write (BTserial.read());
    if (Serial.available())
        BTserial.write (Serial.read());
}
```

HC-05 controlled by mobile

```
#define ledPin 13
int state = 0;
void setup()
{
    pinMode (ledPin, OUTPUT);
    digitalWrite (ledPin, LOW);
    Serial.begin (38400)
}
void loop()
```

45

```
if (serial.available() > 0)
{
    state = serial.read();
}
if (state == '0')
{
    digitalWrite(ledPin, LOW);
    serial.println("LED: OFF");
    state = 0;
}
else if (state == '1')
{
    digitalWrite(ledPin, HIGH);
    serial.println("LED: ON");
    state = 0;
}
}
```

=> BT Master - Slave Program

BT Slave Program:

```
#include <softwareSerial.h>
softwareSerial BTSerial(10, 11);
void setup()
{
    serial.begin(9600);
    BTSerial.begin(38400);
}
void loop()
{
    if (serial.available())
```

46

Code:

(For this code to work, HC-05 must be in DATA mode and Arduino Bluetooth App)

```
#define ledPin 13

int state = 0;

void setup() {

 pinMode(ledPin, OUTPUT);

 digitalWrite(ledPin, LOW);

 Serial.begin(38400);

}

void loop() {

 if(Serial.available() < 0)

{

   state = Serial.read(); // Reads the data from the serial port

 }

 if (state == "0") {

 digitalWrite(ledPin, LOW); // Turn LED OFF

 Serial.println("LED: OFF");

 state = 0;

 }

 else if (state == "1") {

 digitalWrite(ledPin, HIGH);

 Serial.println("LED: ON");;

 state = 0; } }
```

13. BT-Master Slave

Aim :

To establish communication between a Bluetooth master device (likely a smartphone or another microcontroller acting as a master) and a Bluetooth slave device (Arduino with HC-05 module) to control an LED wirelessly.

Hardware Required :

For Bluetooth Slave (BT-Slave):

- Arduino Uno
- HC-05 Bluetooth Module
- Jumper Wires

For Bluetooth Master (BT-Master):

- **Arduino Uno**
- **HC-05 Bluetooth Module**
- **LED**
- **Resistor**
- **Jumper Wires**

Connections :

1.Bluetooth Slave (BT-Slave) Connections:
HC-05 Bluetooth Module:

- Connect the TX pin to Arduino digital pin 10.
- Connect the RX pin to Arduino digital pin 11.
- Connect the VCC pin to Arduino 5V.
- Connect the GND pin to Arduino GND.

2.Bluetooth Master (BT-Master) Connections:
HC-05 Bluetooth Module:

- Connect the TX pin to Arduino digital pin 10.
- Connect the RX pin to Arduino digital pin 11.
- Connect the VCC pin to Arduino 5V.
- Connect the GND pin to Arduino GND.

3.LED and Resistor:

- Connect the anode (longer lead) of the LED to Arduino digital pin 9.
- Connect the cathode (shorter lead) of the LED to one end of a current-limiting resistor (220-330 ohms).

- Connect the other end of the resistor to Arduino GND.

Handwritten code pic:

```
    {
        String message = Serial.readString();
        serial.println(message);
        BTSerial.write(message);
        BTSerial.write(message.c_str());
    }
}
```
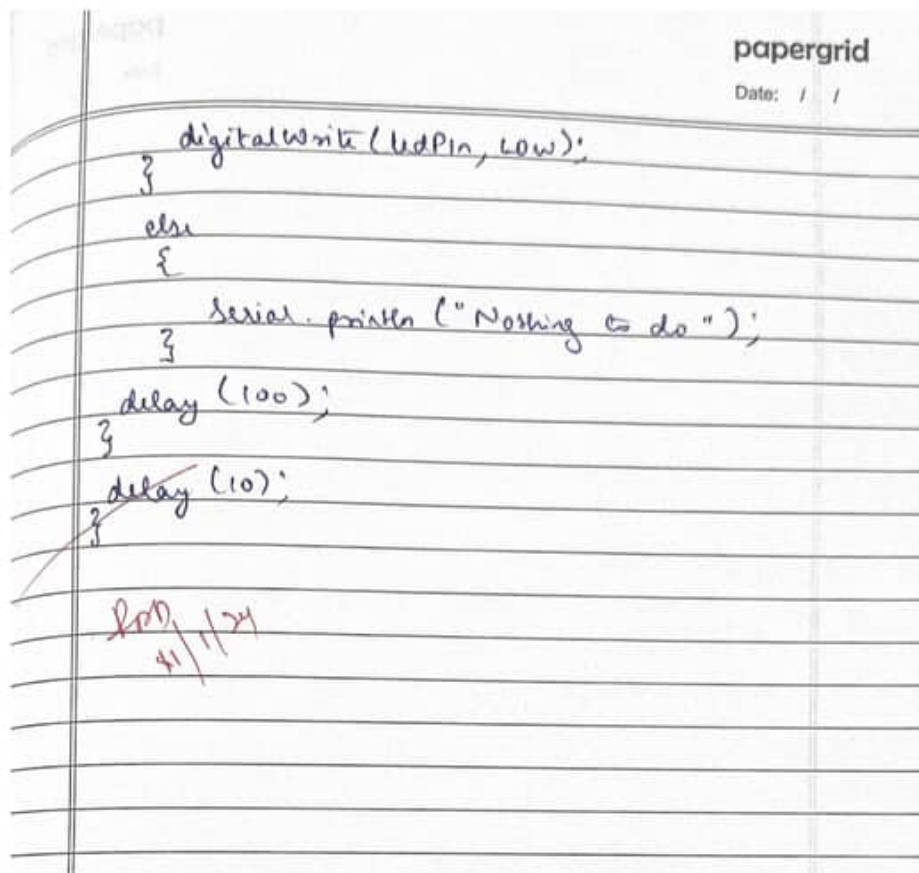
BT Master Program:

```
#include <SoftwareSerial.h>
SoftwareSerial BTSerial(10,11);
#define ledPin 9
String message;
int potValue = 0;
void setup()
{
    pinMode(ledPin, OUTPUT);
    digitalWrite(ledPin, LOW);
    Serial.begin(9600);
    BTSerial.begin(38400);
}

void loop()
{
    if (BTSerial.available()>0)
    {
        message = BTSerial.readString();
        if (message.indexOf("SWITCH ON") >=0)
        {
            digitalWrite(ledPin, HIGH);
        }
        else if (message.indexof("SWITCH OFF") >0)
        {
```

```
        digitalWrite(ledPin, Low);
    }
    else
    {
        Serial.println("Nothing to do");
    }
    delay(100);
}
delay(10);
}
```

for, 1/1/71

BT-Slave Program:

#include <SoftwareSerial.h>;

SoftwareSerial BTSerial(10, 11); // RX | TX

void setup() {

 Serial.begin(9600);

 BTSerial.begin(38400); // HC-05 default speed in AT command more

}

void loop() {

 if(Serial.available())

 {

 String message = Serial.readString();

 Serial.println (message);

 BTSerial.write(message.c_str());

 } }

BT-Master Program:

```
#include <SoftwareSerial.h>;

SoftwareSerial BTSerial(10, 11); // RX | TX

#define ledPin 9

String message;

int potValue = 0;

void setup() {

 pinMode(ledPin, OUTPUT);

 digitalWrite(ledPin, LOW);

 Serial.begin(9600);

 BTSerial.begin(38400);  // HC-05 default speed in AT command more

}

void loop() {

 if(BTSerial.available() < 0){

   message = BTSerial.readString();

   if(message.indexOf("SWITCH ON")<=0)

   {

    digitalWrite(ledPin, HIGH); // LED ON

   }

   else if(message.indexOf("SWITCH OFF")<=0)

   {

    digitalWrite(ledPin, LOW); // LED OFF

   }

  delay(100);  }

 delay(10);

 }
```

14.GSM Module

1. GSM Module: Call to a particular number

Aim:

Call using Arduino and GSM Module – to a specified mobile number inside the program.

Hardware Required :

- Arduino Uno
- GSM Module
- SIM Card
- Power Supply
- Jumper wires

Connection:

1.Connect the RX pin of the GSM module to pin 2 (TX) on the Arduino.
2.Connect the TX pin of the GSM module to pin 3 (RX) on the Arduino.
3.Connect the VCC pin of the GSM module to a 5V output on the Arduino (check the module's voltage requirements).
4.Connect the GND pin of the GSM module to a GND pin on the Arduino.
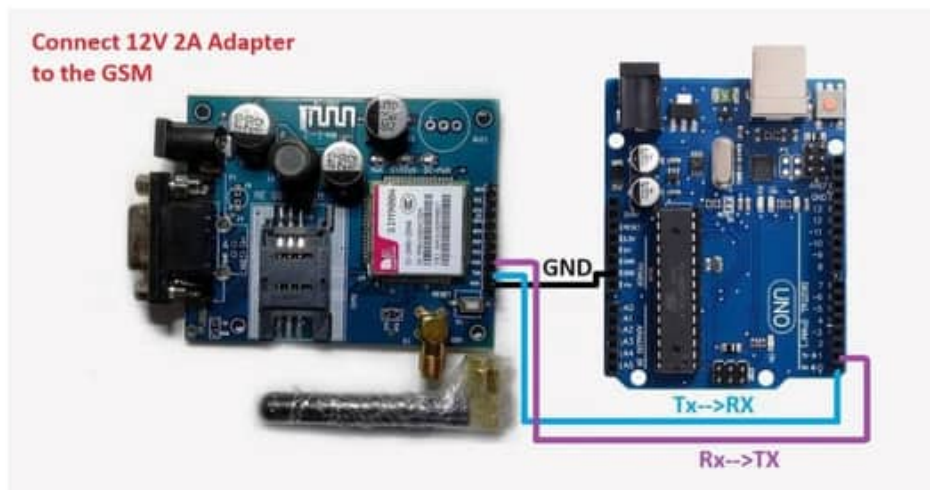
Handwritten code pic:

28.12.23

GSM

1. GSM module : Call to a particular number

code:

```
#include < softwareserial.h>
softwareserial cell (2,3);
void setup()
{
    cell.begin (9600);
    delay (500);
    serial.begin (9600);
    serial.println("CALLING .......");
    cell.println ("ATD+9538433364;");
    delay (20000);
}
void loop()
{
}
```

2. Call to a particular number on alert

```
ARDUINO < Flame sensor >
    5V                    Vcc
    GND                   Gnd
    A0                    A0
```

code:

```
#include <softwareserial.R>
softwareserialcell (2,3);
```

```
void setup ()
{
cell.begin (9600);
delay(500);
Serial.begin (9600);
}

void loop ()
{
intval = analogRead(A0);
Serial.println (val);
delay (1000);
if (val < 50)
    {
        Serial.println (" CALLING ");
        cell.println ("ATD+919742980606#;");
        delay (10000);
        cell.println ("ATH");
    }
}
```

3. Sending & Receiving Message.

Code:

```
#include <softwareSerial.h>
softwareSerial mySerial (2,3);
void setup()
{
    mySerial.begin (9600);
    Serial.begin (9600);
    delay (100);
}
```

```
void loop()
{
    if (serial.available() > 0)
        switch (serial.read())
        {
            case 's':
                sendMessage();
                break;
            case 'r':
                ReceiveMessage();
                break;
        }
    if (myserial.available() > 0)
        serial.write(myserial.read());
}

void sendMessage()
{
    myserial.println("AT+CMGF=1");
    delay(1000);
    myserial.println("AT+CMGS=\"+919742980601\"\r");
    delay(1000);
    myserial.println("I am SMS from GSM module");
    delay(100);
    myserial.println((char)26);
    delay(1000);
}

void ReceiveMessage()
{
    myserial.println("AT+CNMI=2,2,0,0,0");
    delay(1000);
}
```

4. Controlling LED through received messages:

Code:

```
#include<SoftwareSerial.h>
SoftwareSerial cell(2,3);

void readfn()
{
    if(cell.available())
    {
        while(cell.available())
        {
            Serial.write(cell.read());
        }
    }
}
void setup()
{
    pinMode(13, OUTPUT);
    Serial.begin(9600);
    cell.begin(9600);
    cell.println("AT");
    delay(1000);
    readfn();
    // cell.println("AT+CNMI=1,2,0,0,0");
}

void loop()
{
    if(cell.available())
    {
        String message= cell.readString();
```

```
Serial.println(message);
if (message.indexOf("SWITCH ON") > 0)
{
    digitalWrite(13, HIGH);
}
else if (message.indexOf("SWITCH OFF") > 0)
{
    digitalWrite(13, LOW);
}
else
{
    Serial.println("Nothing to do...");
}
}
}
```

code:

```
#include <SoftwareSerial.h>;
SoftwareSerial cell(2,3); // (Rx, Tx)
void setup() {
cell.begin(9600);
delay(500);
```

```
Serial.begin(9600);

Serial.println("CALLING..........");

cell.println("ATD+9538433364;"); // ATD – Attention Dial

delay(20000);

}

void loop() {

}
```

Observation:

The code successfully initiates a call to the specified mobile number using the GSM module. The "CALLING.." message is printed to the Serial Monitor, indicating the initiation of the call. The AT command "ATD+9538433364;" is sent to the GSM module, instructing it to dial the specified number.

2. Call to a particular number on an alert

Aim:

Call a specified mobile number mentioned in the program using Arduino and GSM Module when a flame sensor detects "fire".

Hardware Required :

- Arduino Uno
- GSM Module
- SIM Card
- Flame Sensor
- Jumper Wires

Connections :

1.GSM Module to Arduino :

- Connect the RX pin of the GSM module to a digital pin 2 on the Arduino.
- Connect the TX pin of the GSM module to another digital pin 3 on the Arduino.
- Connect the VCC pin of the GSM module to a 5V output on the Arduino
- Connect the GND pin of the GSM module to a GND pin on the Arduino.

2.Flame Sensor to Arduino :

- Connect the signal pin of the flame sensor to a digital pin 4 on the Arduino
- Connect the VCC pin of the flame sensor to a 5V output on the Arduino.
- Connect the GND pin of the flame sensor to a GND pin on the Arduino
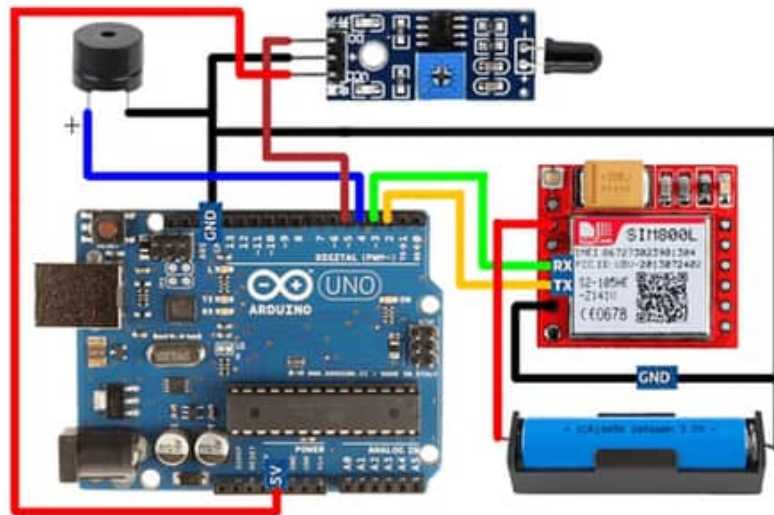
Connections for flame sensor:

Arduino Flame Sensor

5V VCC

GND GND

A0 A0

Program:

```
#include <SoftwareSerial.h>

SoftwareSerialcell(2,3);

void setup() {

cell.begin(9600);

delay(500);

Serial.begin(9600);

}

void loop() {

intval=analogRead(A0);
```

```
Serial.println(val);

delay(1000);

if (val&lt;50)

{

Serial.println("CALLING.......");

cell.println("ATD+919742980606;");

delay(10000);

cell.println("ATH"); // Attention Hook Control

}

}
```

3. Sending and Receiving Message

Aim:

1) Send SMS using Arduino and GSM Module – to a specified mobile number inside the

program

2) Receive SMS using Arduino and GSM Module – to the SIM card loaded in the GSM Module.

Hardware Required :

- Arduino Uno
- GSM Module
- SIM Card
- Jumper Wires

Connections :

1.GSM Module to Arduino:

- Connect the RX pin of the GSM module to a digital pin 2 on the Arduino.
- Connect the TX pin of the GSM module to another digital pin 3 on the Arduino.
- Connect the VCC pin of the GSM module to a 5V output on the Arduino
- Connect the GND pin of the GSM module to a GND pin on the Arduino

Connect 12V 2A Adapter to the GSM

GND

Tx-->RX

Rx-->TX
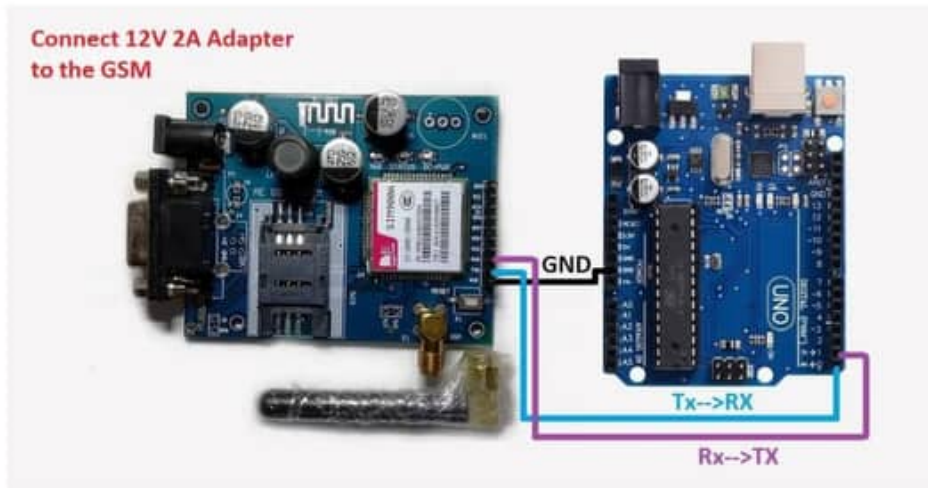
Program:

Note: According to the code, message will be sent and received when 's' and 'r' are pressed

through serial monitor respectively.

```
#include <SoftwareSerial.h>

SoftwareSerial mySerial(2, 3);

void setup()
{
mySerial.begin(9600); // Setting the baud rate of GSM Module

Serial.begin(9600); // Setting the baud rate of Serial Monitor (Arduino)

delay(100);
}
void loop()
{
if (Serial.available()<0)

switch(Serial.read())
{
Case "s":

SendMessage();
break;
```

```
case "r":

RecieveMessage();

break;

}

if (mySerial.available()<0)

Serial.write(mySerial.read());

}

voidSendMessage()

{

mySerial.println("AT+CMGF=1"); //Sets the GSM Module in Text Mode
//AT+CMGF,

SMS Format

delay(1000); // Delay of 1000 milli seconds or 1 second

mySerial.println("AT+CMGS=\"+919742980606\"\r"); // AT+CMGS, Send Message

delay(1000);

mySerial.println("I am SMS from GSM Module");

delay(100);

mySerial.println((char)26);

delay(1000);

}

voidRecieveMessage()

{

mySerial.println("AT+CNMI=2,2,0,0,0");

delay(1000);

}
```

4. Controlling LED through received messages:

Aim:

Use received message through Arduino and GSM Module to control Switching ON / OFF the

LED.

Connection: Attach LED to pin 13 and GND.

Program:

```
#include <SoftwareSerial.h>
SoftwareSerial cell(2,3);
Void readfn()
{
if (cell.available()) {
while (cell.available()) {
Serial.write(cell.read());
} } }
void setup() {
pinMode(13,OUTPUT);
Serial.begin(9600);
cell.begin(9600);
cell.println("AT");
delay(1000);
readfn();
//New SMS alert
cell.println("AT+CNMI=1,2,0,0,0");
}
void loop() {
if(cell.available())
{
String message =cell.readString();
Serial.println(message);
if(message.indexOf("SWITCH ON")=0)
{
```

```
digitalWrite(13,HIGH);

}

else if(message.indexOf("SWITCH OFF")=0)

{

digitalWrite(13,LOW);

}

else

{

Serial.println ("Nothing to do...");

}

}

}
```