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PHAGWARA, PUNJAB

TOPIC-MOTION DETECTION USING PIR SENSOR

Figure 1-Motion Detection

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Section: EM202

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Course Code & Name: ECE083, Workshop on Arduino Programming

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ACKNOWLEDGEMENT

We would like to express my sincere gratitude towards our guide, **Dr. Praveen Kumar Malik**, who gave his full support in the working of this project work with his stimulating suggestions and encouragement all the time. He has always been a source of ideas and inspiration.

I would like to thank my friends and family for the strength that keep me standing and for the hope that keep me believing that this report would be possible.

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ABSTRACT

Motion detection using a PIR sensor circuit can be used for providing security to home, shopping malls etc, as the PIR sensor used in this system detects the motion of human around this circuit. With the help of buzzer, we can identify the motion of human which was detected by the sensor. This system can be used at any place where security is needed. Security is needed by everyone in the society now-a-days to protect their property or confidential information from others which is sensor sense a human motion and then transmit the signal wirelessly.

However, in this project with the buzzer turning on as soon as any motion is sensed we are also giving the notification to the user on their mobile phones on the telegram app. So that if the user is not in the home or the proximity of the home and is not able to hear the buzzer due to any reason then the notification will alert the user about the intrusion.

INTRODUCTION

Motion detection is the process of detecting a change in the position of an object relative to its surroundings or a change in the surroundings relative to an object. It can be achieved by either mechanical or electronic methods. When it is done by natural organisms, it is called motion perception.

The principal methods by which motion can be electronically identified are optical and acoustic. Infrared light or laser technology can be used for optical detection. Motion-detection devices such as PIR motion detectors have a sensor that detects a disturbance in the infrared spectrum. A signal can then activate an alarm, and/or a camera to capture an image or video of the event.

A motion sensor (or motion detector) is an electronic device that is designed to detect and measure movement. Motion sensors are used primarily in home and business security systems, but they can also be found in phones, paper towel dispensers, game consoles, and virtual reality systems. Unlike many other types of sensors (which can be handheld and isolated), motion sensors are typically embedded systems with three major components: a sensor unit, an embedded computer, and hardware (or the mechanical component). These three parts vary in size and configuration, as motion sensors can be customized to perform highly specific functions. For example, motion sensors can be used to activate floodlights, trigger audible alarms, activate switches, and even alert the police.

There are two types of motion sensors: active motion sensors and passive motion sensors. Active sensors have both a transmitter and a receiver. This type of sensor detects motion by measuring changes in the amount of sound or radiation reflecting back into the receiver. When an object interrupts or alters the sensor's field, an electric pulse is sent to the embedded computer, which in turn interacts with the mechanical component. The most common type of active motion detector uses ultrasonic sensor technology; these motion sensors emit sound waves to detect the presence of objects. There are also microwave sensors (which emit microwave radiation), and tomographic sensors (which transmit and receive radio waves).

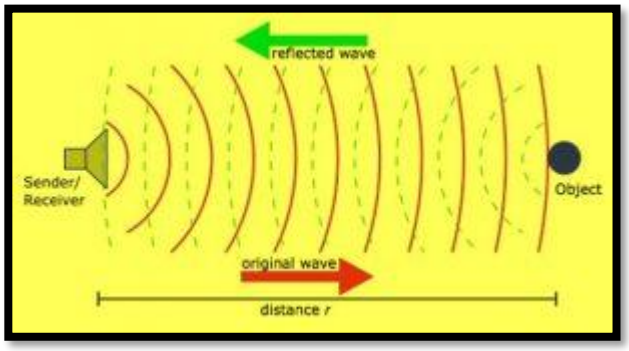

Figure 2-Active Motion Sensor

Unlike an active motion sensor, a passive motion sensor does not have a transmitter. Instead of measuring a constant reflection, the sensor detects motion based on a perceived increase of radiation in its environment. The most widely used type of passive motion sensor in home security systems is the passive infrared (PIR) sensor. The PIR sensor is designed to detect the infrared radiation emitted naturally from the human body. The receiver is contained in a filter that only allows infrared to pass through it. When a person walks into the PIR sensor's field of detection, the difference in radiation creates a positive charge within the receiver; this perceived change causes the sensing unit to send electrical data to the embedded computer and hardware component.

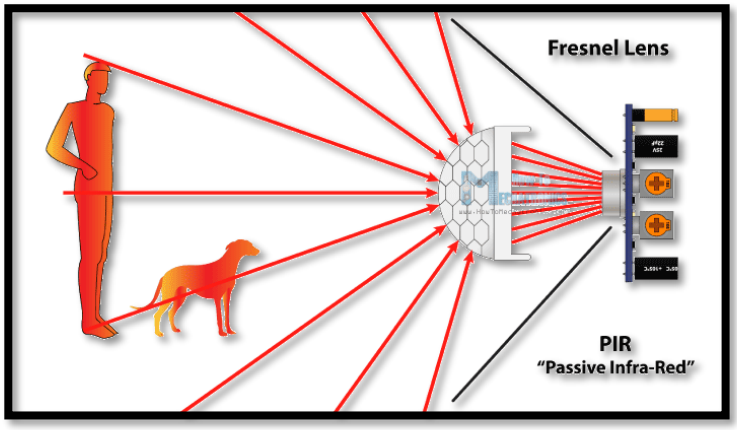

Figure 3-Passive Motion Sensor

METHODOLOGY FOLLOWED

We began our work by exploring different types of motion detection sensors. We studied about the types of sensors such as active and passive sensors and their types such as ultrasonic sensors and passive infrared sensors. Then our primary requirement was to decide which microcontroller to use as we wanted Wi-Fi connectivity to get notifications on our mobile phone.

We then decided to use ESP32 module so that we can get notification on our mobile on Telegram app whenever an intrusion is detected. But we also wanted to add some additional feature, so we decided to add a buzzer so that the intruder is troubled and he does some mistake whenever he/she realizes that his/her presence has been detected and now some action will be taken against him/her.

We faced some issues in interfacing our PIR sensors such as to decide their sensitivity and their range then we studied about them in detail and interfaced them successfully. Our Faulty Dr. Praveen Kumar Malik helped us in understanding the things whenever we faced any circuitry problem or any interfacing problem.

HARDWARE DISCRIPTION -

- **NodeMcu ESP32-**

NodeMCU is famous for the ESP8266 module with the LUA programming language. Now, this is a more powerful NodeMCU with ESP32 on it.
ESP32 is the big brother of ESP8266. It comes with dual-core 32-bit processor, built-in WiFi and Bluetooth, more RAM and Flash memory, more GPIO, more ADC, and many other peripherals. NodeMCU ESP32 is an ESP-WROOM-32 module in breadboard friendly form factor.
The ESP32 chip comes with 48 pins with multiple functions. Not all pins are exposed in all ESP32 development boards, and some pins cannot be used.

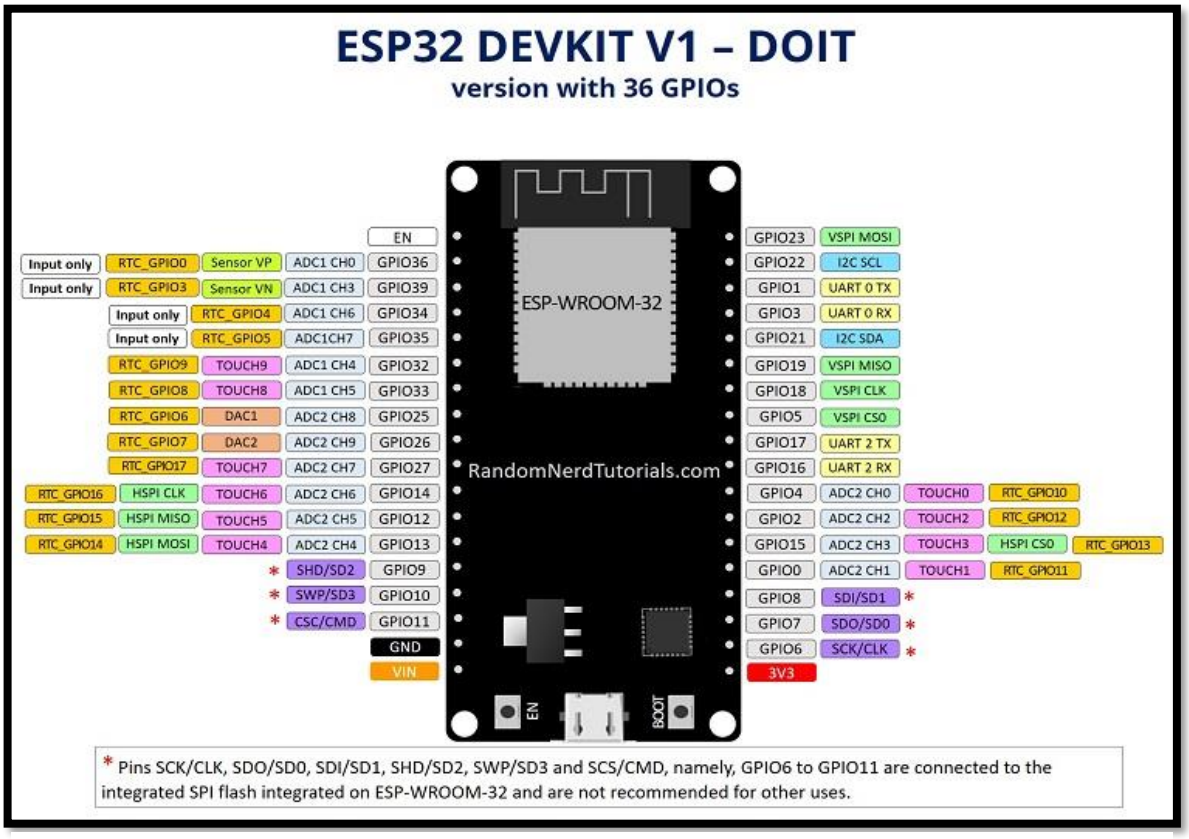

Figure 4-NodeMCU ESP32

- **PIR Sensor-**

The term PIR is the short form ofthe PassiveInfra Red. The term “passive”indicates that the sensor does not actively take part in the process, whichmeans, it does not emit the referred IR signals itself, rather passively detects the infrared radiationscoming from thehuman body in the surrounding area.

The detected radiations are converted into an electrical charge, which is proportional to the detected level of the radiation. Then this charge is further improved by a built in FET and fed to the output pin of the device which becomes applicable to an external circuit for further triggering

and amplification of the alarm stages. The PIR sensor range is up to 10 meters at an angle of +15 degree or -15 degree.

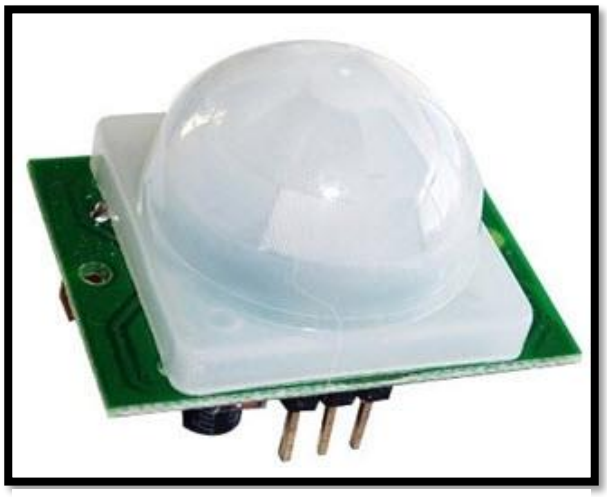

Figure 5-PIR Sensor

- **Breadboard-**

  An electronics breadboard (as opposed to the type on which sandwiches are made) is actually referring to a **solderless breadboard**. These are great units for making temporary circuits and prototyping, and they require absolutely no soldering.

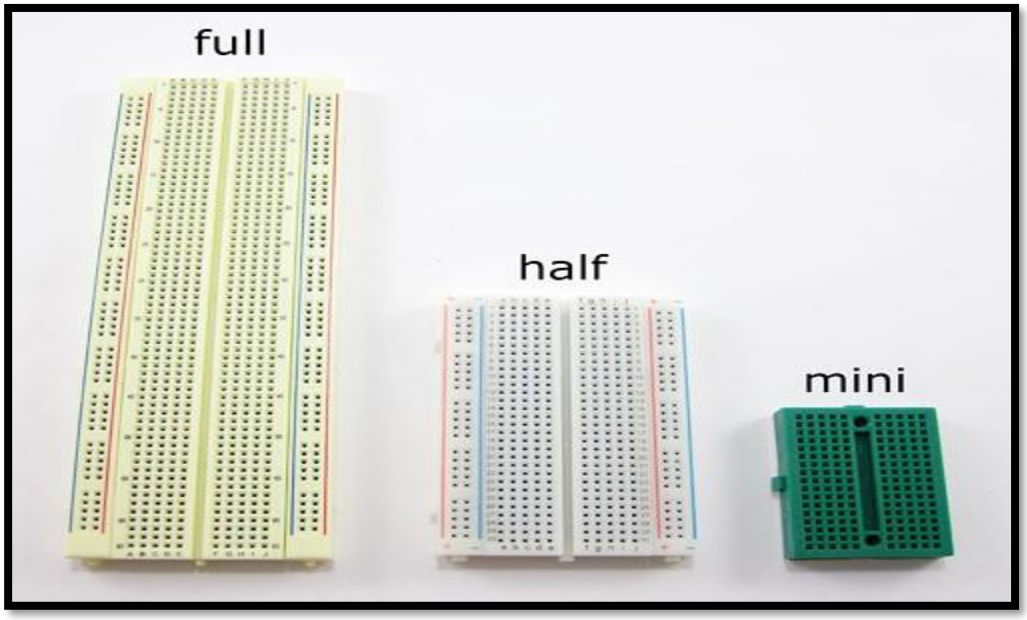

Figure 6-Breadboard

- **Buzzer-**

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound.

Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

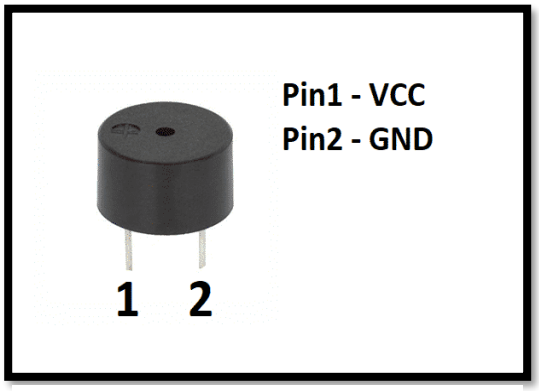

Figure 7-Buzzer

- **12v Adaptor-**

  An **adaptor** is a device that converts attributes of one electrical device or system to those of an otherwise incompatible device or system. Some modify power or signal attributes, while others merely adapt the physical form of one connector to another.

Figure 8-12 V Adaptor

- **Voltage Regulator-**

  The **voltage regulator IC 7805** is actually a member of the 78xx series of voltage regulator ICs. It is a fixed linear voltage regulator. The xx present in 78xx represents the value of the fixed output voltage that the particular IC provides. For 7805 IC, it is +5V DC regulated power supply.

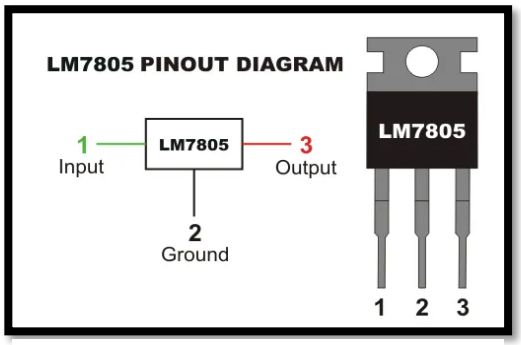

Figure 9-IC7805(Voltage Regulator)

CODE USED

```
//**********---------Project of ECE-083 -----**********

//**********---------Home security system ---**********

//****----submitted by :-

//****--- Harsh Bhadani  - 12014525

//****--- Siddharth      - 12006050

//****--- Nandini Singh  - 12016334

//****--- Muloy Juior    - 12000067


#include <WiFi.h>

#include <WiFiClientSecure.h>

#include <UniversalTelegramBot.h>

#include <ArduinoJson.h>

// My Network credentials

const char* ssid = "Hotspot";

const char* password = "harsh0000";

// Initialize Telegram BOT

#define BOTtoken "5905158870:AAFWXVlkMfS4Eu_BafbLR0-h_phBVCapcCw"  // your Bot Token

#define CHAT_ID "1882834023"  // My instagram chat ID

// Since telegram bots can be accessed from any mobile so i give my chat id so that the bot can be accessed only from my device.

WiFiClientSecure client;
```

```
UniversalTelegramBot bot(BOTtoken, client);
const int motionSensor1 = 27; // PIR Motion Sensor 1
const int motionSensor2 = 26; // PIR Motion Sensor 2
int buzzer = 25;            // Buzzer
bool motionDetected1 = false;
bool motionDetected2 = false;
// Indicates when motion is detected from sensors
void IRAM_ATTR detectsMovement1()
{
  motionDetected1 = true;
}
void IRAM_ATTR detectsMovement2()
{
  motionDetected2 = true;
}
void setup()
{  Serial.begin(115200);
  // PIR Motion Sensor mode INPUT_PULLUP
  pinMode(motionSensor1, INPUT_PULLUP);
  pinMode(motionSensor2, INPUT_PULLUP);
  pinMode(buzzer, OUTPUT);
    // Set motionSensor pin as interrupt, assign interrupt function and set RISING mode
  attachInterrupt(digitalPinToInterrupt(motionSensor1), detectsMovement1, RISING);
   // interrupt   for sensor1
```

```
  attachInterrupt(digitalPinToInterrupt(motionSensor2), detectsMovement2, RISING); // interrupt for sensor2
  // Attempt to connect to Wifi network:
  Serial.print("Connecting Wifi: ");
  Serial.println(ssid);
  WiFi.mode(WIFI_STA);
  WiFi.begin(ssid, password);
  client.setCACert(TELEGRAM_CERTIFICATE_ROOT); // Add root certificate for api.telegram.org
    while (WiFi.status() != WL_CONNECTED) {
    Serial.print(".");
    delay(500);
  }
  Serial.println("");
  Serial.println("WiFi connected");
  Serial.print("IP address: ");
  Serial.println(WiFi.localIP());
  bot.sendMessage(CHAT_ID, "Bot started up", "");   // send message to bot after starting
}
void loop()
{  if(motionDetected1 || motionDetected2) // initiate buzzer if there is any motion detected
  {
    digitalWrite(buzzer, HIGH);
    delay(4000);
```

```
    digitalWrite(buzzer, LOW);
  }
    if(motionDetected1)   // if motion is detected in sensor 1 then send notification to telegram
  {
    bot.sendMessage(CHAT_ID, "Motion detected in 1!!", "");
    Serial.println("Motion Detected in 1");
    motionDetected1 = false;
  }
     if(motionDetected2) // if motion detected from sensor 2
  {
    bot.sendMessage(CHAT_ID, "Motion detected in 2!!", "");
    Serial.println("Motion Detected in 2");
    motionDetected2 = false;
  }
}

//------------------********************* -----THANK YOU-----*****************----------
```

RESULT

Arduino IDE Screenshot-

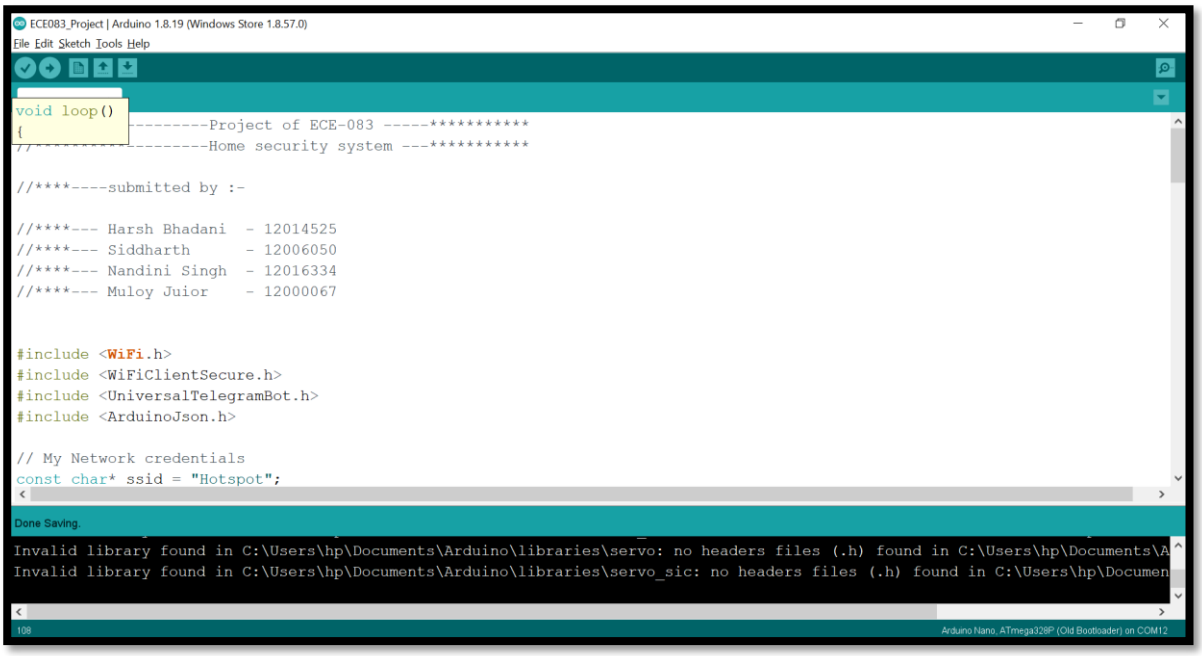

Figure 10-Arduino IDE

Circuit Diagram-

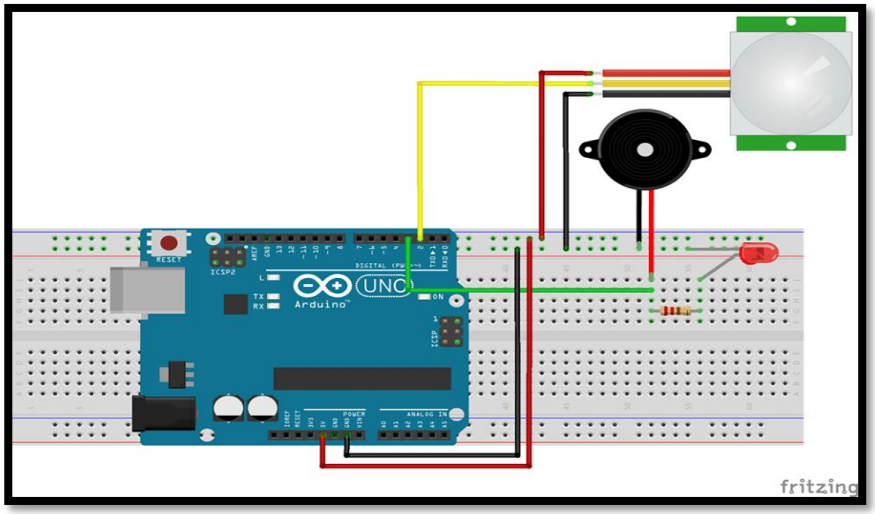

Figure 11-Circuit Diagram on TinkerCad

Our Project-

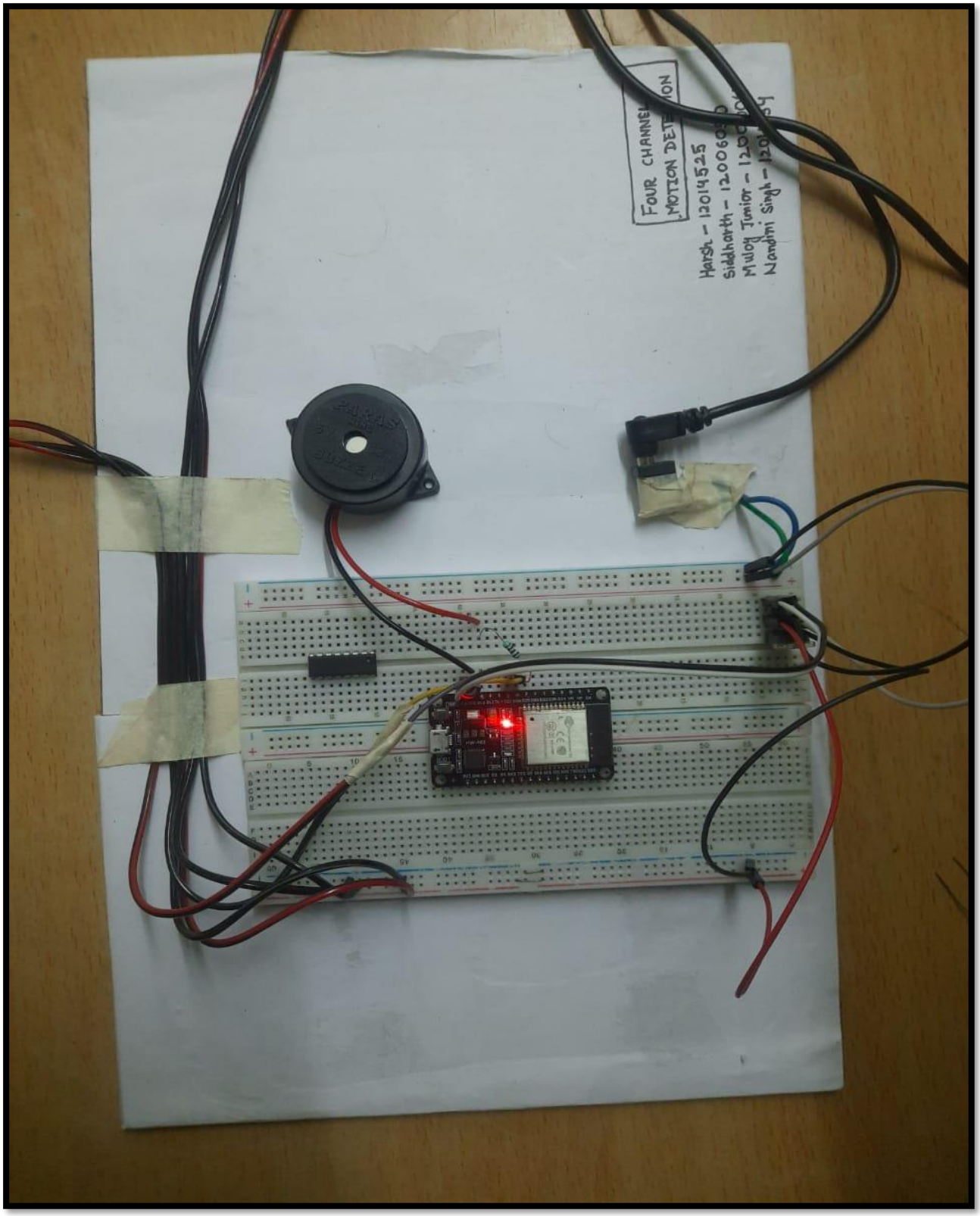

Figure 12-Final Hardware

Telegram APP Notification-

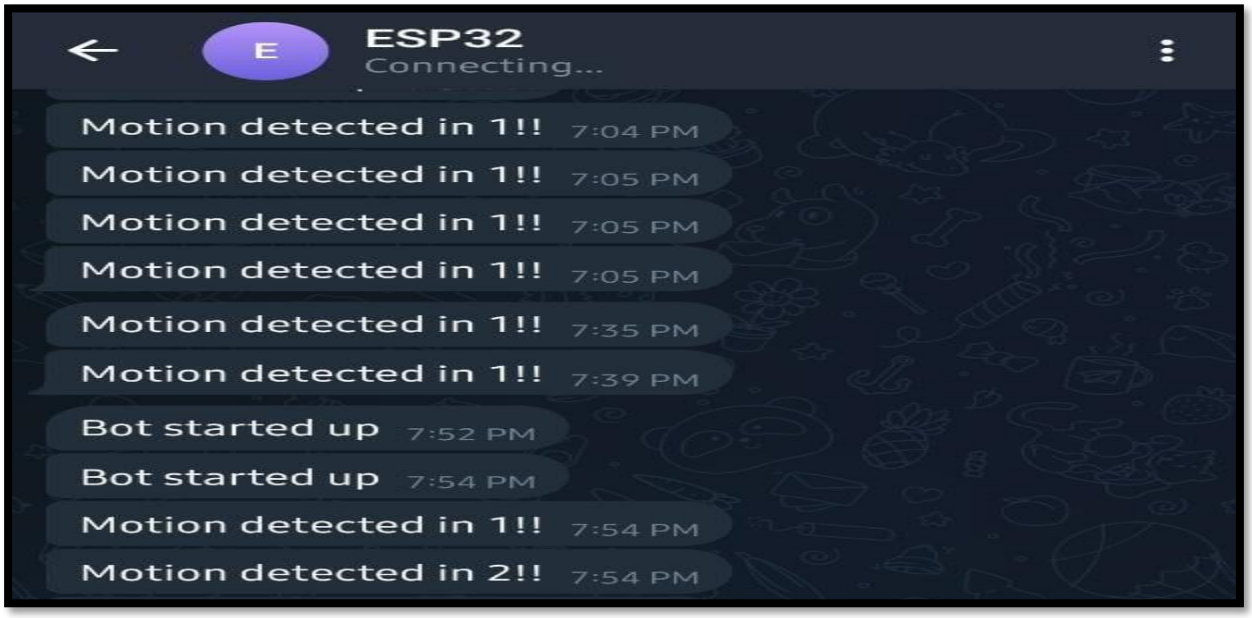

Figure 13-Getting notification on User's Mobile

CONCLUSION

Practical knowledge means the visualization of the knowledge, which we read in our books. For this, we perform experiments and get observations. Practical knowledge is very important in every field. One must be familiar with the problems related to that field so that he may solve them and become a successful person.

After achieving the proper goal in life, an engineer must enter professional life. According to this life, he must serve an industry, may be public or private sector or self-own. For efficient work in the field, he must be aware of practical knowledge as well as theoretical knowledge.

Due to all the above reasons and our insight into the area of the embedded systems we decided to make the motion detection project using a PIR sensor, we added extra feature of getting the notification on the mobile application so that the user is notified about the intrusion wherever he/she is present.

We have tried our level best to achieve our goal. In the process of making this project we came across several problems but all were dealt in a proper manner which helped us in increasing our knowledge about motions sensors, how to get notification on our mobile phones using ESP32 module and the most important one being the interfacing of PIR sensors and their working.

REFERENCES

WEB-

- https://nodemcu.readthedocs.io/en/dev-esp32/
- https://www.bayalarm.com/commercial/burglar-alarm-systems-commercial/how-do-motion-sensors-work-a-guide/
- https://www.fierceelectronics.com/sensors/what-a-motion-sensor
- https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor
- https://en.wikipedia.org/wiki/Passive_infrared_sensor