INTERNET OF THINGS

AND

APPLICATIONS

(3160716)

Student Name: Satyam Acharya

Student Enrollment No.: 200570107122

Student Class: 6EC2

Student Batch: Computer Engineering

Experiment 1

Title: Exploring Open Source Hardware & its Application

a. Arduino
b. Raspberry Pi

Arduino

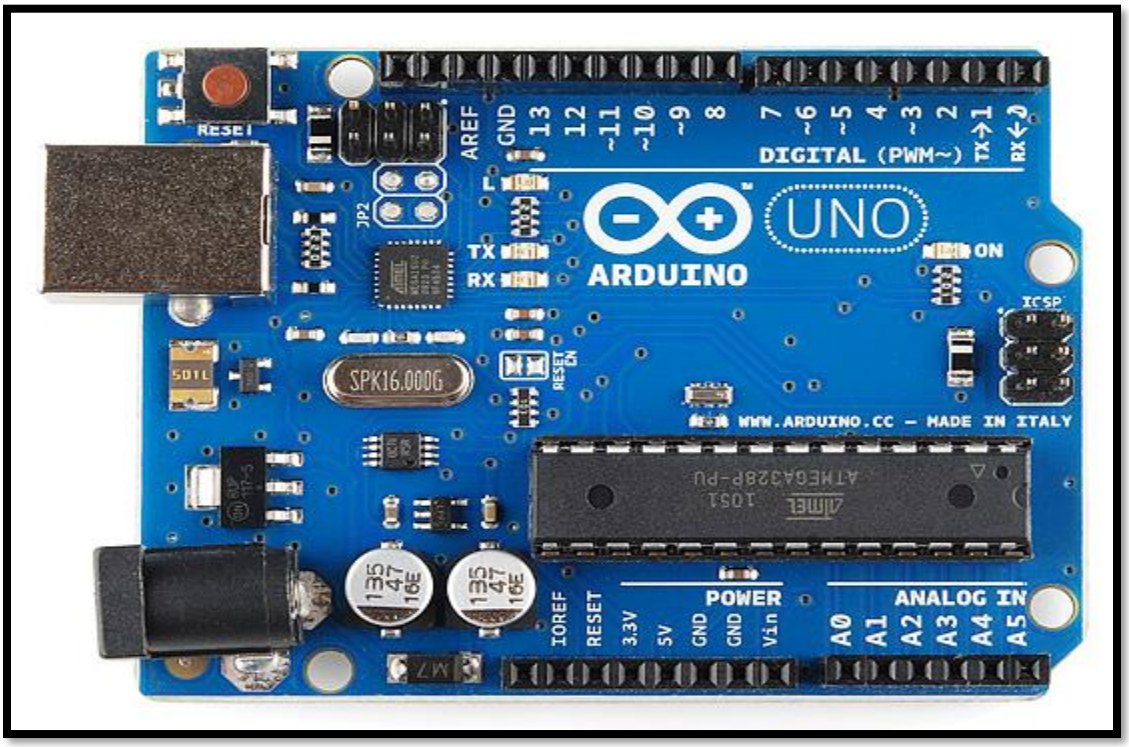
Description of Arduino:

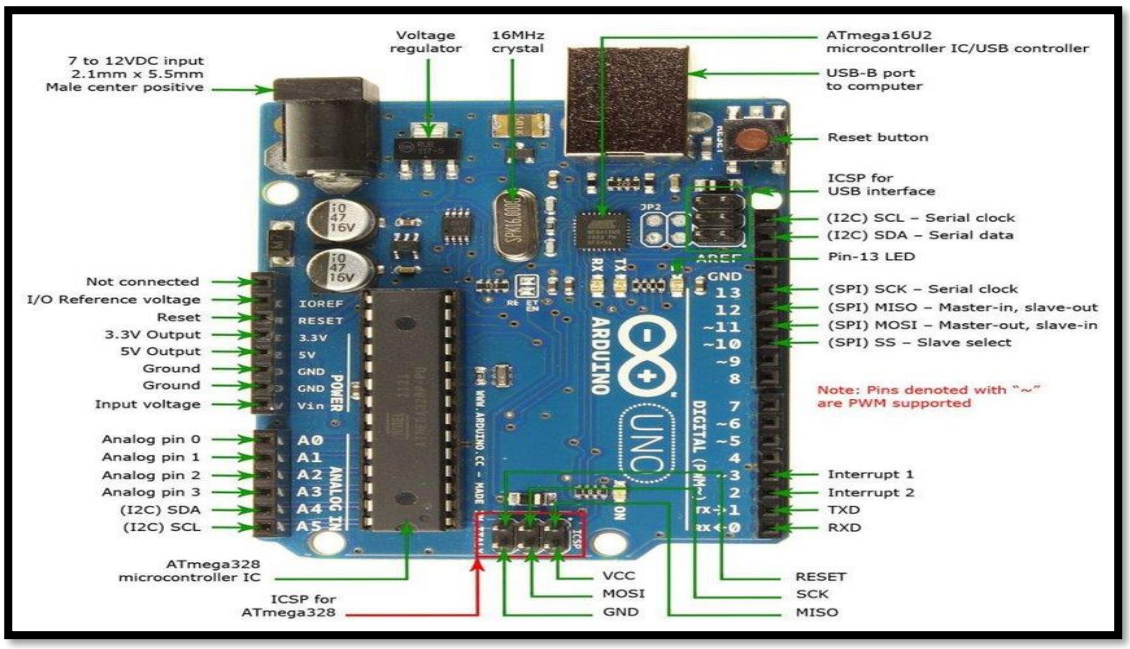
Arduino is an open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. Arduino board designs use a variety of microprocessors and controllers. The microcontrollers can be programmed using the C and C++ programming languages, using a standard API, also known as the Arduino Programming Language, inspired by the Processing language and used with a modified version of the Processing IDE. Used to write and upload computer code to the physical board.

1. **List of components used in practical:**
   - Arduino uno R3
   - Power (USB / Barrel Jack)
   - Pins (5V, 3.3V, GND, Analog, Digital, PWM, AREF)
   - Reset Button
   - Power LED Indicator
   - Main IC

2. **Steps to perform practical of Arduino:**
   1. First you must have your Arduino board and a USB cable.
   2. Download Arduino IDE Software.
   3. Power up your board.
   4. Launch Arduino IDE.
   5. Open your first project.
   6. Select your Arduino board.
   7. Select your serial po

3. Images of Arduino uno R3:





Arduino uno R3

4. **Application of Arduino:**
    - motion sensors
    - outlet control
    - temperature sensors
    - blower control
    - garage door control
    - air flow control

Raspberry Pi:

Description of Raspberry Pi:

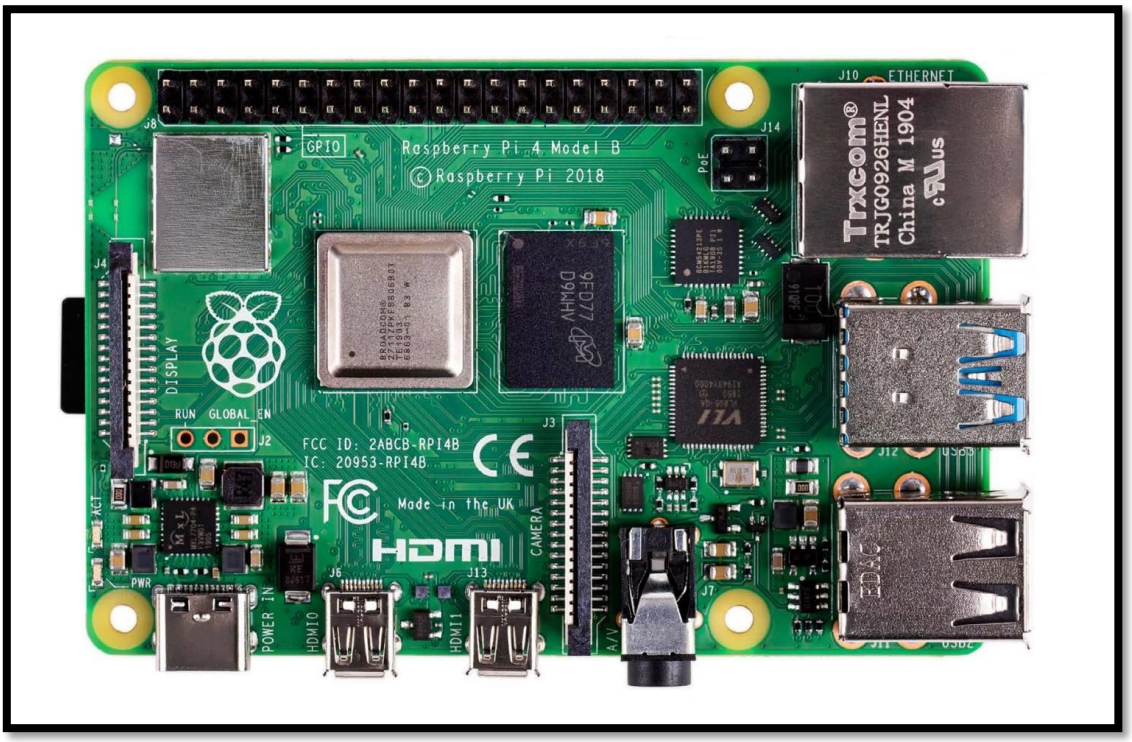
Raspberry Pi is a series of small single-board computers (SBCs) developed in the United Kingdom by the Raspberry Pi Foundation in association with Broadcom. The Raspberry Pi project originally leaned towards the promotion of teaching basic computer science in schools and in developing countries. The original model became more popular than anticipated, selling outside its target market for uses such as robotics. It is widely used in many areas, such as for weather monitoring, because of its low cost, modularity, and open design. It is typically used by computer and electronic hobbyists, due to its adoption of HDMI and USB standards.

1. **List of components used in practical:**
    - program memory (RAM)
    - processor and graphics chip
    - CPU
    - GPU
    - Ethernet port
    - GPIO pins
    - various interfaces
    - A Raspberry Pi, any version (Optional)
    - A Windows, Mac, or Linux computer
    - A LED
    - Resistors
    - A breadboard and jumper wires
    - Access to the Internet

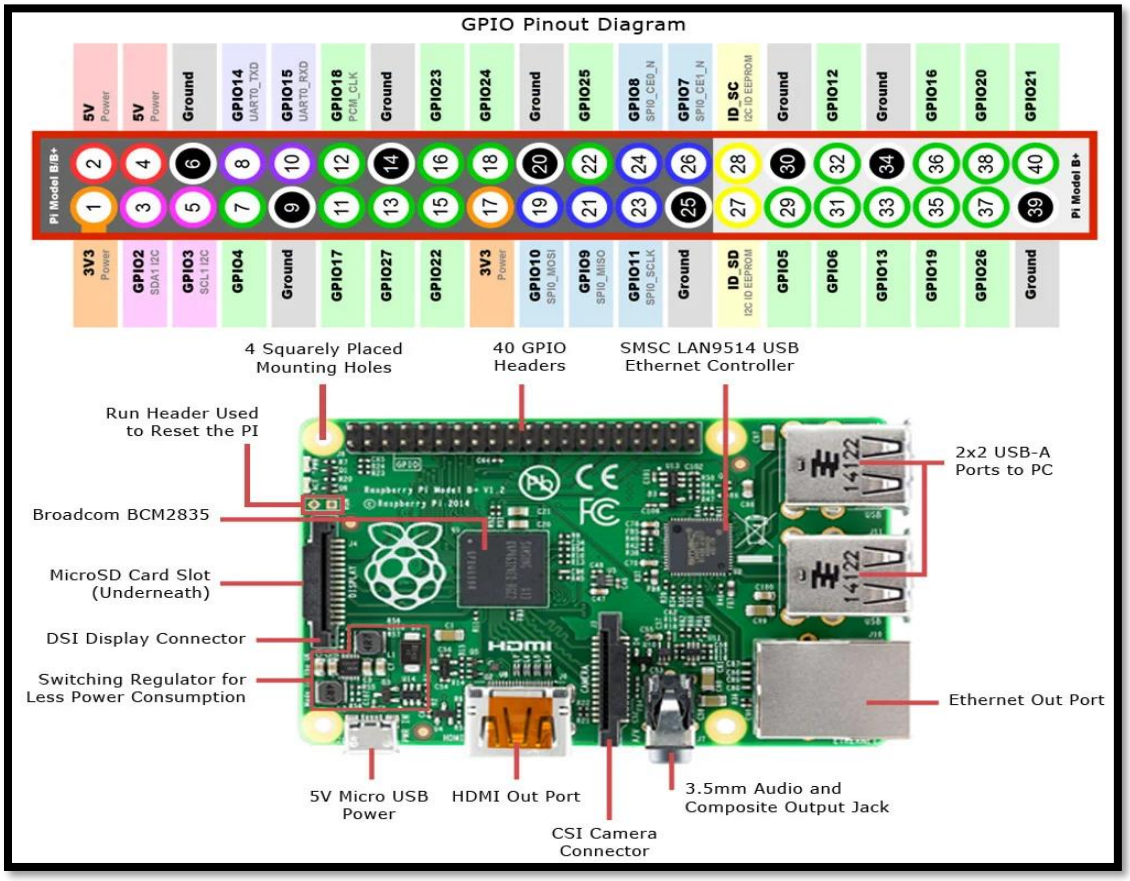
2. Steps to perform practical of Raspberry Pi:

1. Set up the Raspbian operating system to the RPi.
2. Wire up your Raspberry Pi to create a fully functional computer.
3. Use and Learn Python programming language.
4. Write Python code to control the Raspberry Pi hardware.
5. Install a Python virtual environment.
6. Use the RPi GPIOs as digital input and outputs.

3. Images of Raspberry Pi:



Raspberry Pi



Raspberry Pi pin diagram

4. Application of Raspberry Pi:

- Retro Gaming
- Raspberry Pi Tablet
- Low-Cost Desktop PC
- Raspberry Pi Cluster
- Raspberry Pi Cloud Server
- Raspberry Pi Media Center

Experiment 2

Title: Basics of Following Hardware / Sensors & its Application

a. PIR Motion Sensor
b. Infrared Sensor
c. Rain Drop Sensor
d. Moisture Sensor
e. Temperature Sensor
f. Touch Sensor
g. Infrared Sensor
h. Servo Motor
i. RFID Sensor
j. Bluetooth Module
k. Wi-Fi Module

a. PIR Motion Sensor:

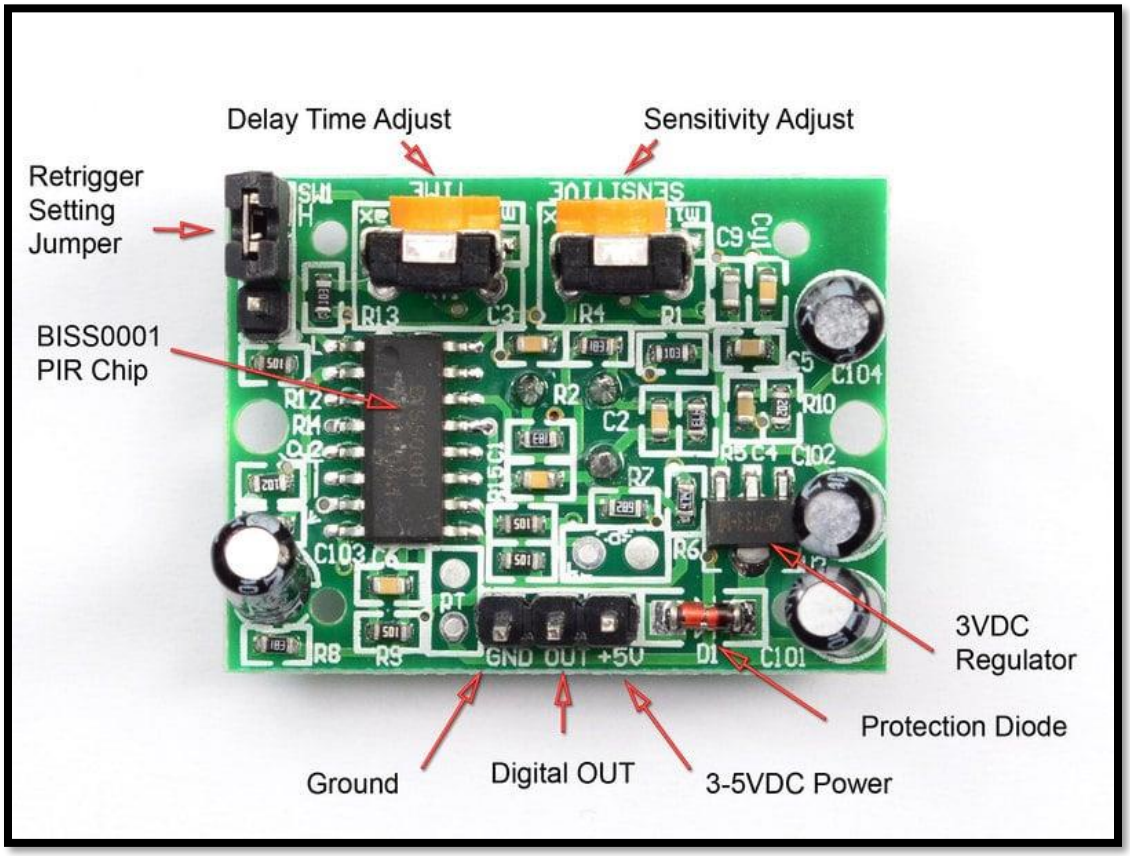
Description PIR Motion Sensor:

PIR sensors allow you to sense motion. They are used to detect whether a human has moved in or out of the sensor's range. They are commonly found in appliances and gadgets used at home or for businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

1. **List of components used in practical:**
   - three pins,
   - power supply pin
   - output signal pin
   - ground pin

2. **Steps to perform practical PIR Motion Sensor:**
   1. Build the Circuit
   2. Code with blocks
   3. Pir motion sensor Arduino code explained
   4. Pin motion sensor setup
   5. Build a physical Arduino circuit
   6. Pir motion sensor adjustments

3. Images of PIR Motion Sensor:



PIR Motion Sensor

4. Application of PIR Motion Sensor:

- Thermostats And HVAC Systems
- Smart Home And IoT
- IP Cameras
- Surveillance Systems

b. Infrared Sensor:

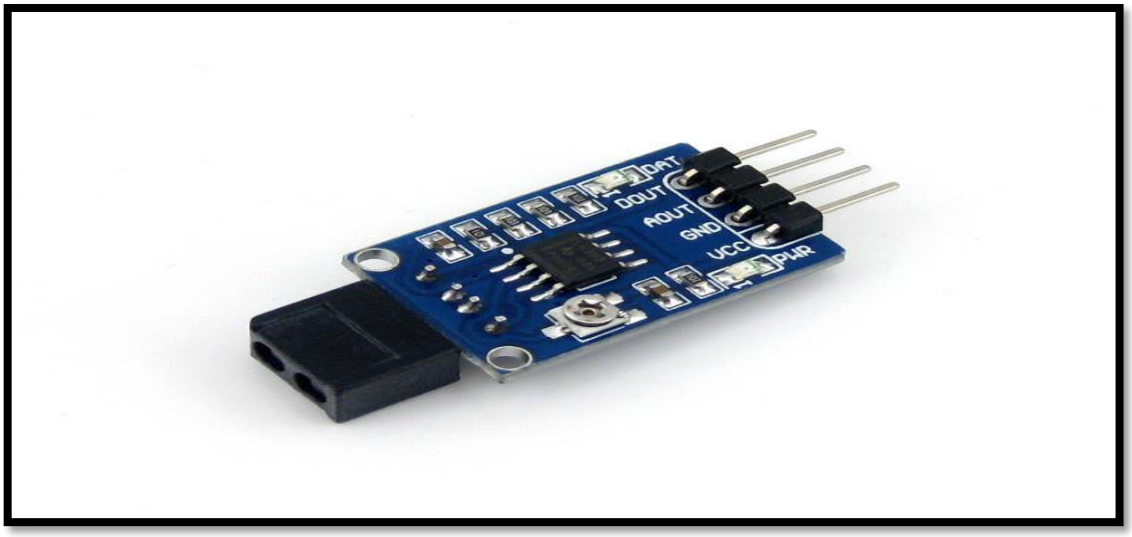
Description Infrared Sensor:

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herschel in 1800. There are two types of infrared sensors: active and passive. Active infrared sensors both emit and detect infrared radiation. Active IR sensors have two parts: a light-emitting diode (LED) and a receiver. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. Active IR sensors act as proximity sensors, and they are commonly used in obstacle detection systems.

1. **List of components used in practical:**
   - 2 IR transmitter and receiver pair
   - Resistors of the range of kilo-ohms
   - Variable resistors
   - LED (Light Emitting Diode)

2. **Steps to perform practical Infrared Sensor:**
   1. Connect the negative wire on the IR sensor to GND on the Arduino.
   2. Connect the middle of the IR sensor which is the VCC to 5V on the Arduino.
   3. Connect the signal pin on the IR sensor to pin 8 on the Arduino.

3. **Images of Infrared Sensor:**



4. **Application of Infrared Sensor:**
   - optical power meters
   - sorting devices
   - missile guidance
   - remote sensing
   - flame monitors
   - moisture analyzers
   - night vision devices
   - infrared astronomy
   - rail safety

c. Rain Drop Sensor:

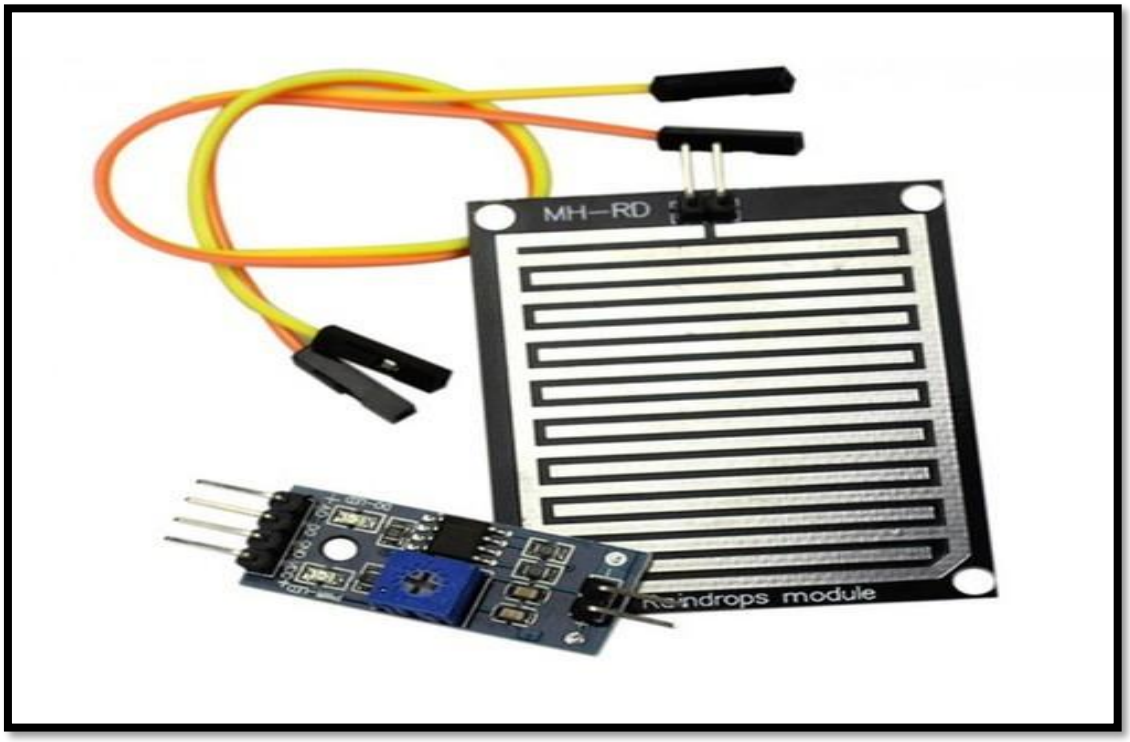
Description of Rain Drop Sensor:

Water sensor brick is designed for water detection, which can be widely used in sensing rainfall, water level, and even liquid leakage. consists of two modules a rain board that detects the rain and a control module that compares the analog value and converts it in to digital value.

1. **List of components used in practical:**
   - Arduino UNO board
   - Raindrop sensor
   - LM393 Driver
   - Connecting wires
   - Arduino software

2. **Steps to perform practical Rain Drop Sensor:**
   1. Connect the Vcc pin to 5 Volts (5V) if you use analog pin or connect Vcc pin to 3.3 Volts(3.3V) if you use digital pin.
   2. Connect the A0 pin to pin A0.
   3. Connect the GND pin to ground (GND)
   4. + pin of sensor to + pin of module.
   5. - pin of sensor to - pin of module.

3. **Images of Rain Drop Sensor:**



4. **Application of Rain Drop Sensor:**
   - Rain-sensing wipers are a great convenience feature in a luxury car
   - It is used in aircraft
   - Fit in an existing housing area

d. Moisture Sensor

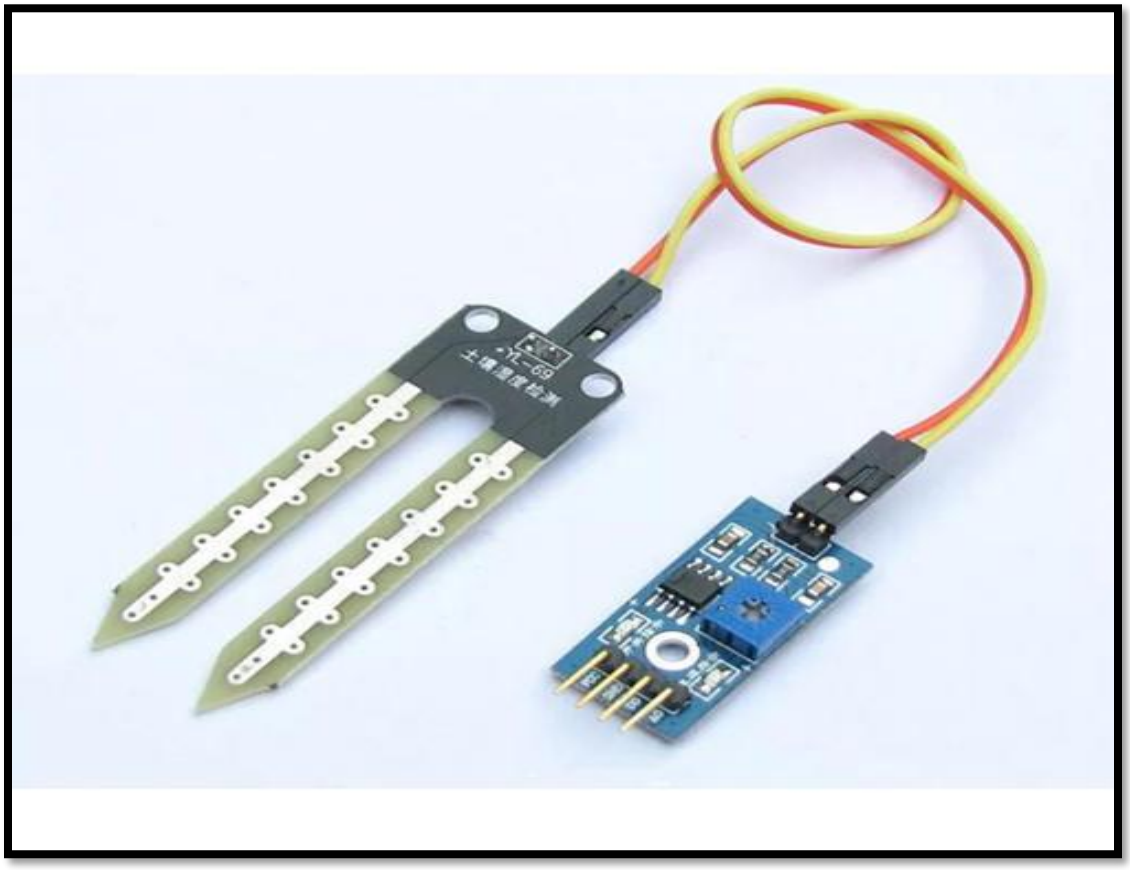
Description of Moisture Sensor:

The soil moisture sensor consists of two probes that are used to measure the volumetric content of water. The two probes allow the current to pass through the soil, which gives the resistance value to measure the moisture value.

1. **List of components used in practical:**
   - Arduino UNO board
   - Soil moisture sensor
   - LM393 Driver
   - Connecting wires
   - Arduino software

2. **Steps to perform practical Moisture Sensor:**
   1. The module has a built-in potentiometer for setting the moisture level
   2. The module outputs LOW and the status LED lights up.
   3. To set the threshold, stick the probe into the soil when your plant needs watering and turn the pot clockwise until the Status LED is on.

3. **Images of Moisture Sensor:**



4. **Application of Moisture Sensor:**
   - Agricultural science and horticulture including irrigation planning
   - Climate research, or environmental science including solute transport studies
   - Auxiliary sensors for soil respiration measurements

e. Temperature Sensor:

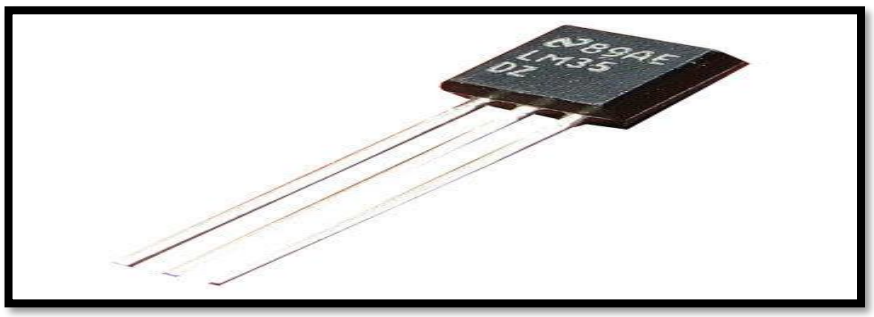
Description Of Temperature Sensor:

The Temperature Sensor LM35 series are precision integrated-circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°cover a full −55°C to 150°C temperature range.

1. **List of components used in practical:**
   - Arduino UNO board
   - GY-65 Sensor
   - Small Bread Board
   - Connecting wires
   - Arduino software

2. **Steps to perform practical Temperature Sensor:**
   1. Connect the +Vs to +5v on your Arduino board.
   2. Connect Vout to Analog0 or A0 on Arduino board.
   3. Connect GND with GND on Arduino

3. **Images of Temperature Sensor:**



4. Application of Temperature Sensor:

- Calibration and Instrumentation
- Transit – refrigerated vans and lorries
- HVAC – Heating Ventilation and Air Conditioning
- Power and Utilities
- Renewable energy
- Heat Exchangers
- Laboratory and testing applications

f. Touch Sensor:

Description of Touch Sensor:

A sensor that is capable enough of capturing and recording the physical touch made by the operator can be defined as a touch sensor. Further, it is also referred to as a touch detector. A touch sensor (also called a touch button or touch switch) is widely used to control devices (touchable lamps). It has the same functionality as a button. It is used instead of the button on many new devices because it makes the product look neat.

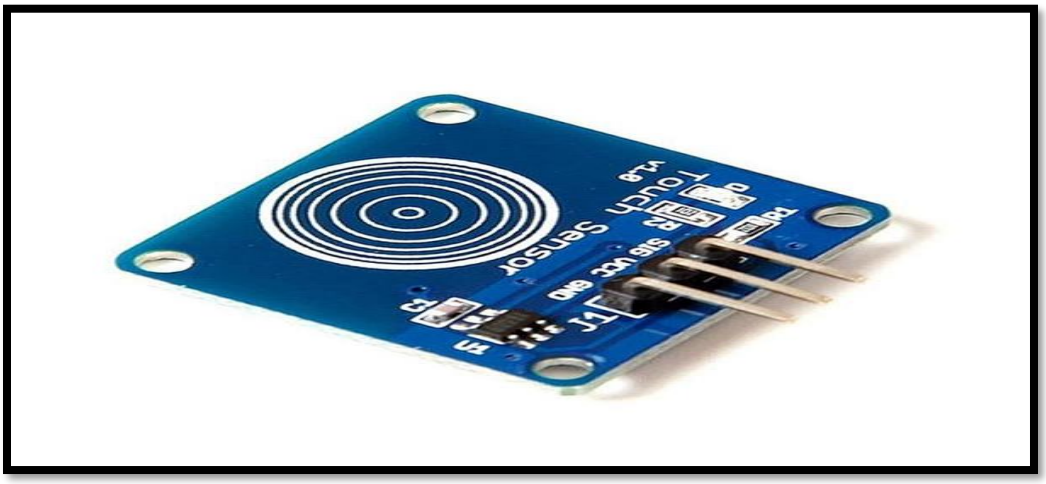
1. List of components used in practical:

- Arduino UNO
- USB cable for uploading the code
- Touch sensor
- Jumper wires Breadboard
- One LED
- A 220-ohm resistor

2. Steps to perform practical Touch Sensor:

1. Connect the Touch Sensor to 5V.
2. Connect the Touch Sensor to Digital Pin 10.
3. Connect the Touch Sensor to Ground.
4. Insert LED into Breadboard.
5. Insert 220 Ohm Resistor into the Breadboard.
6. Connect LED to Ground.

3. **Images of Touch Sensor:**



4. **Application of Touch Sensor:**
   - Mobile phones to remote controls and appliance control panels
   - Portable devices such as smartphones and tablets (iPhones, iPad, etc.)
   - Home applications such as touch lamps
   - Automotives
   - Industrial

g. Infrared Sensor

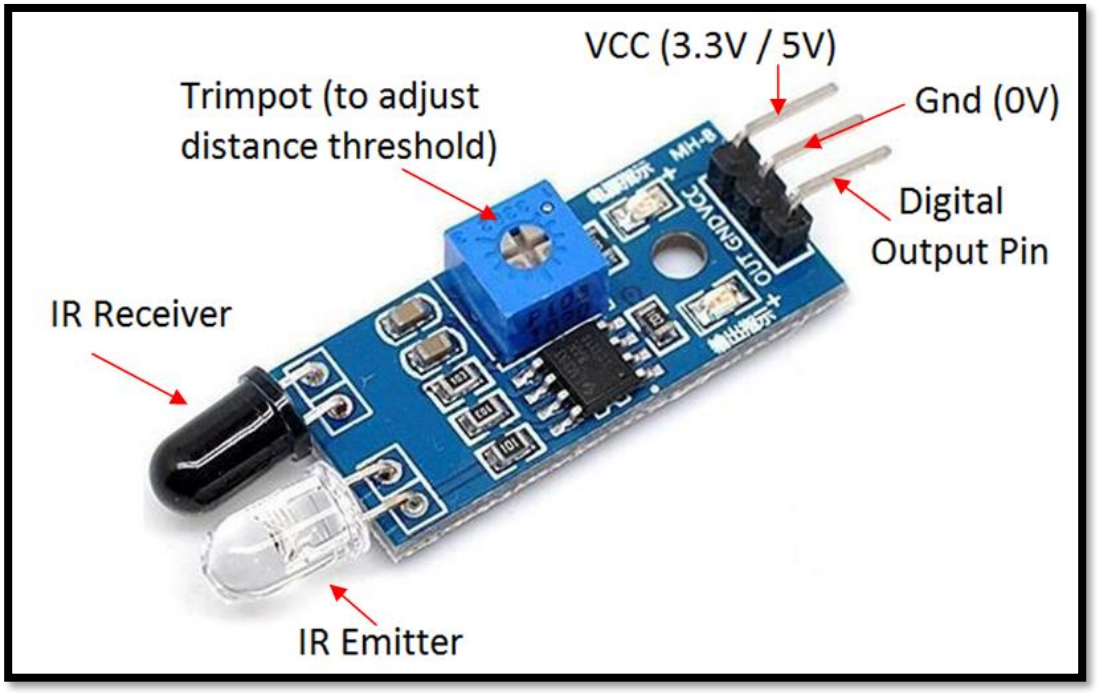
Description of Infrared Sensor:

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herschel in 1800. There are two types of infrared sensors: active and passive. Active infrared sensors both emit and detect infrared radiation. Active IR sensors have two parts: a light-emitting diode (LED) and a receiver.

1. **List of components used in practical:**
   - Arduino UNO board
   - Ultrasonic Sensor HCSR04
   - LCD
   - Two Resistors 100Ω each
   - Two LEDs
   - Small Bread Board
   - Connecting wires
   - Arduino software

2. **Steps to perform practical Infrared Sensor:**
   1. Connect the negative wire on the IR sensor to GND on the Arduino.
   2. Connect the middle of the IR sensor which is the VCC to 5V on the Arduino.
   3. Connect the signal pin on the IR sensor to pin 8 on the Arduino.

3. **Images of Infrared Sensor:**



4. **Application of Infrared Sensor:**
   - Loop control
   - Roll diameter, tension control, winding, and unwinding
   - Liquid level control
   - Thru beam detection for high-speed counting
   - Full detection
   - Thread or wire break detection

h. Servo Motor

Description of Servo Motor:

A Servo Motor is a small device that has an output shaft. This shaft can be positioned to specific angular positions by sending the servo a coded signal. As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft. Servos are extremely useful in robotics. The motors are small, have built-in control circuitry, and are extremely powerful for their size.

1. **List of components used in practical:**
   - Arduino UNO board
   - Servo Motor
   - ULN2003 driving IC
   - 10 KΩ Resistor

2. **Steps to perform practical Servo Motor:**
   1. The servo motor has a female connector with three pins.
   2. Connect the power cable that in all standards should be red to 5V on the Arduino.
   3. Connect the remaining line on the servo connector to a digital pin on the Arduino.

3. **Images of Servo Motor:**

4. **Application of Servo Motor:**
   - Cameras, telescopes and antennas.
   - Elevator technology.
   - Robotics.
   - Industrial production.

i. RFID Sensor:

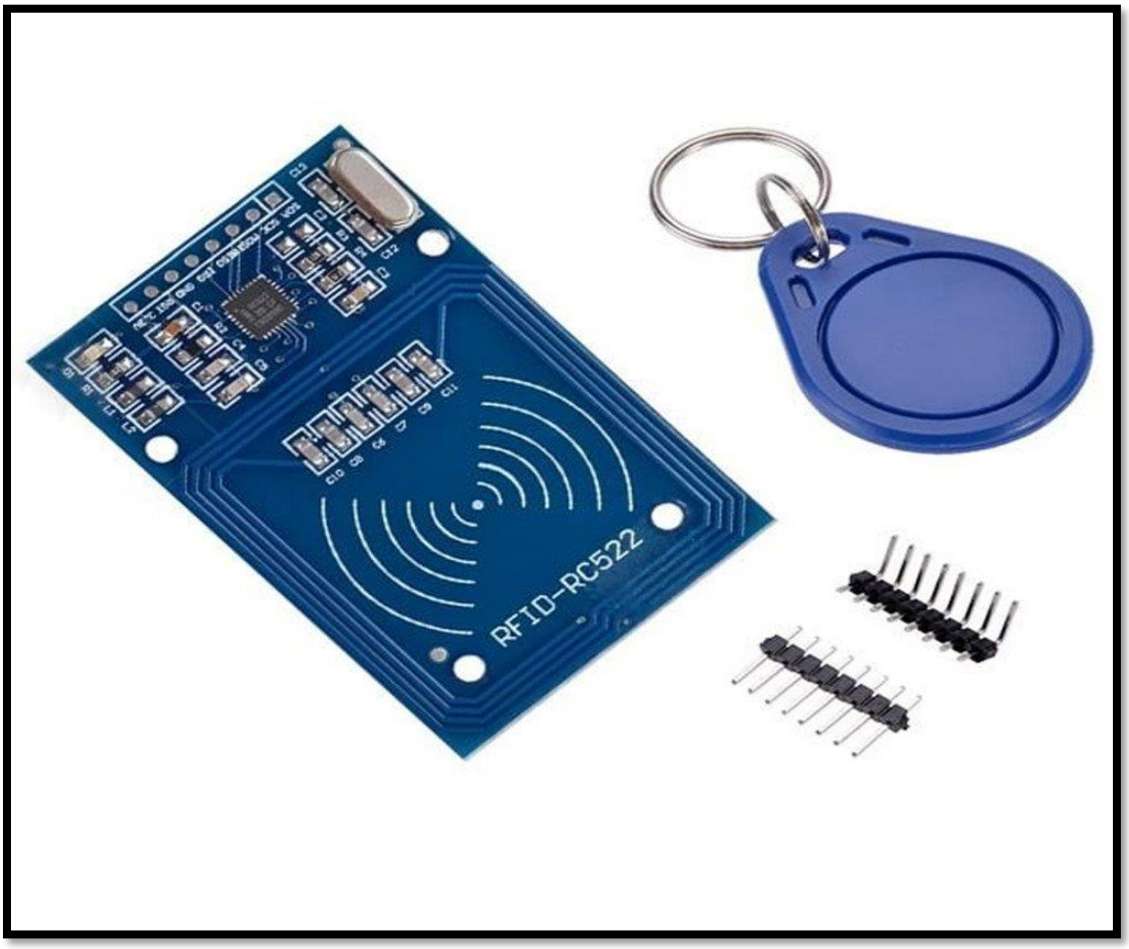
Experiment Description of RFID Sensor:

Radio Frequency Identification (RFID) refers to a wireless system comprised of two components: tags and readers. The reader is a device that has one or more antennas that emit radio waves and receive signals back from the RFID tag. Every RFID system consists of three components: a scanning antenna, a transceiver, and a transponder. When the scanning antenna and transceiver are combined, they are referred to as an RFID reader or interrogator. There are two types of RFID readers -- fixed readers and mobile readers. The RFID reader is a network-connected device that can be portable or permanently attached. It uses radio waves to transmit signals that activate the tag. Once activated, the tag sends a wave back to the antenna, where it is translated into data. The transponder is in the RFID tag itself. The read range for RFID tags varies based on factors including the type of tag, type of reader, RFID frequency and interference in the surrounding environment or from other RFID tags and readers. Tags that have a stronger power source also have a longer read range.

1. **List of components used in practical:**
   - Jumper wires (generic)
   - Alphanumeric LCD, 20 x 4
   - RFID reader (generic)
   - Breadboard
   - Arduino UNO
   - Servo Module

2. **Steps to perform practical RFID Sensor:**
   1. RFID Reader.
   2. After Library installed, open the "Dumpinfo" from examples and upload it in your Arduino IDE.
   3. Open two Arduino IDE window and Select Arduino UNO as Board and select the appropriate COM port.
   4. Select the serial device of the board from the Tools / Serial Port menu. And output

3. Images of RFID Sensor:



4. Application of RFID Sensor:

- inventory control
- cargo and supply chain logistics
- vehicle tracking
- customer service and loss control
- improved visibility and distribution in the supply chain
- access control in security situations
- shipping
- healthcare
- manufacturing

j. Bluetooth Module:

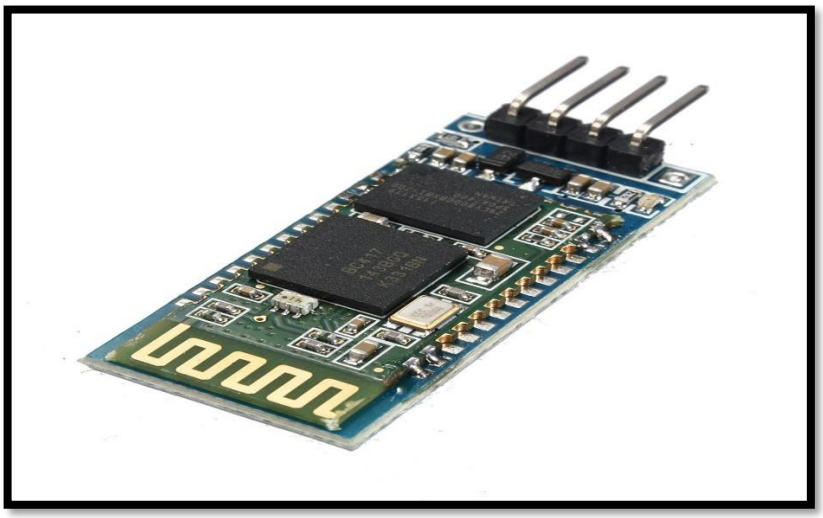
Experiment Description of Bluetooth Module:

Bluetooth module (Bluetooth module) refers to the basic circuit set of the chip with integrated Bluetooth function, used for short-range 2.4G wireless communication module. For the end user, the Bluetooth module is a semi-finished product Bluetooth BLE module is a technology that acts as an interface that aids the wireless Bluetooth Low energy connection of any two devices and establishes a protocol for the communication of data between the devices. Bluetooth low energy module's mediated data communication range is usually an average of tens of meters and data is communicated in specified frequency bands.

1. **List of components used in practical:**
   - Arduino UNO R3
   - HC-05 Bluetooth Module
   - 5V Relay Module
   - 12V dc Adapter
   - AC Wall Socket and Plug
   - M-M Jumper wires

2. **Steps to perform practical Bluetooth Module:**
   1. Connect Module to Arduino.
   2. Plug in the Arduino and Upload the Sketch.
   3. Connect to the Bluetooth on Your Phone.
   4. Connect to the Bluetooth Module.

3. **Images of Bluetooth Module:**



4. **Application of Bluetooth Module:**
    - In laptops, notebooks, and wireless PCs.
    - In mobile phones and PDAs (personal digital assistants).
    - In printers.
    - In wireless headsets.
    - In wireless PANs (personal area networks) and even LANs (local area networks)
    - To transfer data files, videos, and images and MP3 or MP4.

k. Wi-Fi Module

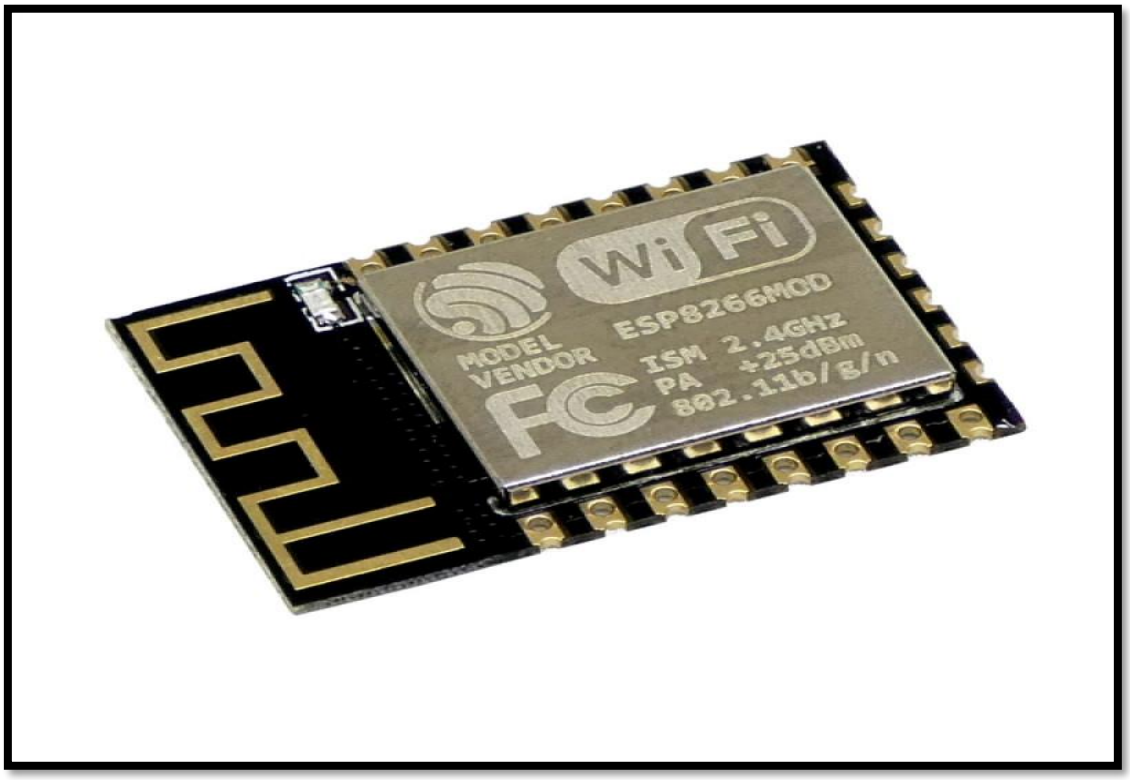
Experiment Description of Wi-Fi Module:

Wireless modules are used in a variety of industrial, scientific, consumer, and commercial applications. With Wi-Fi modules, utilities and service providers, as well as their customers, can communicate directly with water heaters, air conditioning systems, thermostats, and other electrical products in the home. Wi-Fi module, also known as serial to WIFI module, belongs to the transmission layer of IoT. The function is to convert the serial port or TTL level into an embedded module that can conform to Wi-Fi wireless network communication standard, with built-in wireless network protocol IEEE802.11 B.G.N protocol stack and TCP/IP protocol stack.

1. **List of components used in practical:**
    - 2.4 GHZ Wi-Fi
    - General-purpose input/output (16 GPIO)
    - Inter-Integrated Circuit (I^2C) serial communication protocol
    - Analog-to-digital conversion (10-bit ADC)

2. **Steps to perform practical Wi-Fi Module:**
    1. connect the red wire to VIN(3.3V) to the +3.3V power from the microcontroller.
    2. connect the black wire to the ground.
    3. connect the green wire to the TX of the Wi-fi module and microcontroller.
    4. connect the yellow wire to the RX of the wi-fi module and microcontroller.

3. **Images of Wi-Fi Module:**



4. **Application of Bluetooth Module:**
   - Access points portals
   - IoT projects
   - Wireless data logging
   - Used in learning the networking fundamentals
   - Sockets and smart bulbs
   - Smart home automation systems

Experiment 3

Title: Experiment using Arduino Uno to keep Buzzer/LED ON/OFF.

Experiment Description:

It's simple, tone (buzzer, 1000) sends a 1KHz sound signal to pin 9, delay (1000) pauses the program for one second and no Tone(buzzer) stops the signal sound. The loop () routine will make this run again and again making a short beeping sound. An Arduino Buzzer is basically a beeper. The Arduino buzzer is a device that produces sound when an electric current is passed through it. The Arduino buzzer can be directly connected to the Arduino and produce different tones by giving different frequency electric pulses to the buzzer.

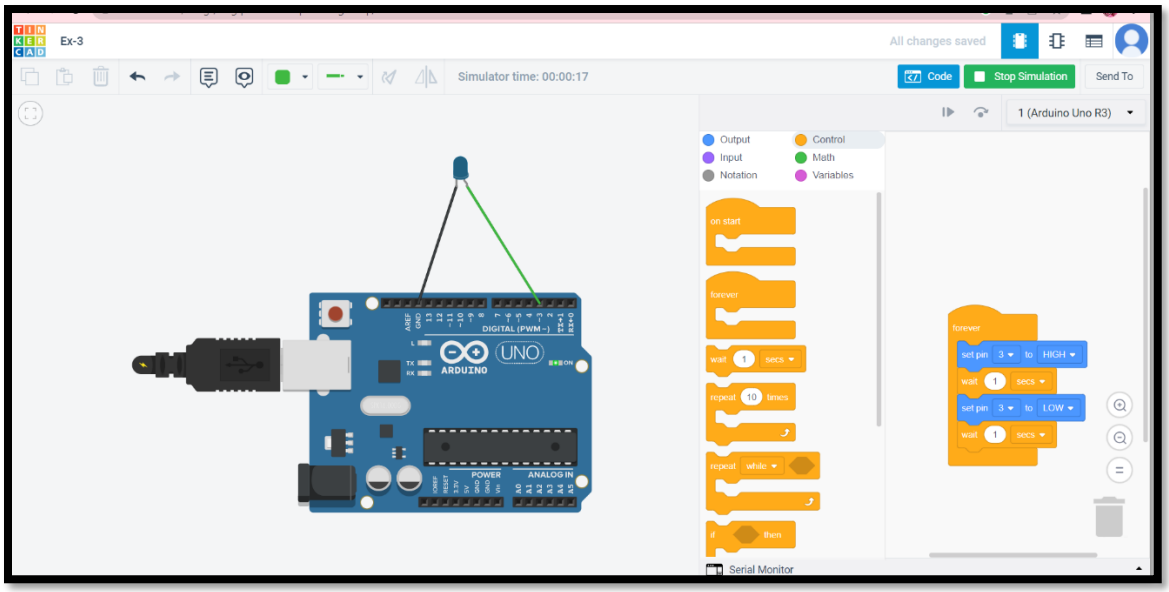
1. **List of components used in practical:**

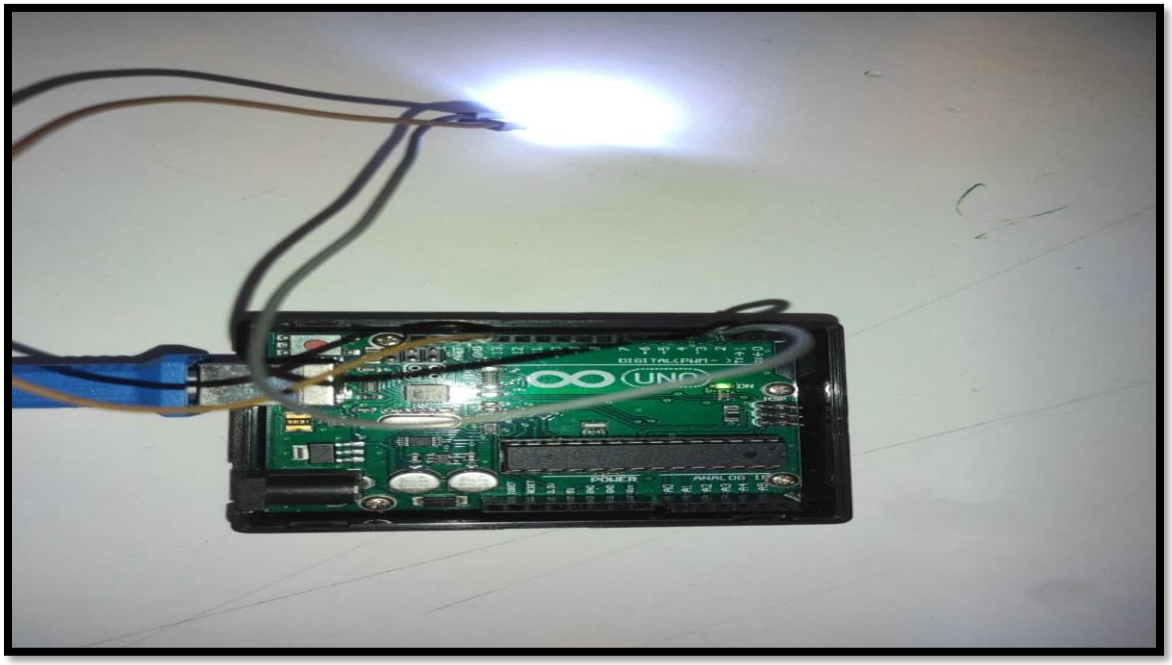
- Arduino Uno
- LED
- Wires
- USB connector
- jumper wires
- Laptop

2. **Steps to perform practical Buzzer/LED ON/OFF.**

1. Write the code on your Arduino uno ide.
2. Take an Arduino uno, USB connector, led, jumper wires.
3. Connect the cathode and anode of led with ground and pin no 4 with Arduino bord.
4. Connect the entire circuit with your laptop using USB connector.
5. Upload your code into Arduino bord circuit.
6. Run the code and note the output of led.

3. Screenshot of Buzzer/LED ON/OFF:





4. Code:

```
// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(4, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(4, HIGH);  // turn the LED on (HIGH is the voltage level)
  delay(1000);                    // wait for a second
  digitalWrite(4, LOW);   // turn the LED off by making the voltage LOW
  delay(1000);                    // wait for a second
}
```

5. Analysis:

Let's sum up by saying that the Arduino Uno is a flexible microcontroller that can be used to manage a variety of electronic devices, such as buzzers and LEDs. It is possible to turn these components on and off using simple code and by using it in different areas and where it is necessary by using the digital input and output pins on the Arduino Uno.

6. Application:

- Alarm System: A buzzer can be connected to the Arduino uno to create a simple alarm system that sound when a specific condition is met.
- Traffic light: An LED can be used as a traffic light by programing the Arduino uno to turn the LED on and off in a specific sequence.
- Game controller: A buzzer can be used as a game controller by programming the Arduino uno.
- Environmental monitoring: An LED can be used as an indicator for environmental monitoring systems.
- Sound and light show: By programming the Arduino uno to control multiple LEDs and buzzers, you can create a custom sound and light show.

Experiment 4

Title: Experiment using Arduino Uno to prepare a Traffic management system using LED

Experiment Description:

Roads without any supervision or guidance can lead to traffic conflicts and accidents. Traffic signals are required for an orderly flow of traffic. A traffic signal is used as an instructing device that indicates the road user to act as per the displayed sign. This project is a simple three-way version of the traffic light controller using Arduino and very few components. It is an electronic project by which we will get knowledge about traffic lights and how they work. This project is the simple version of a traffic light system where we have demonstrated it for three sides or ways.

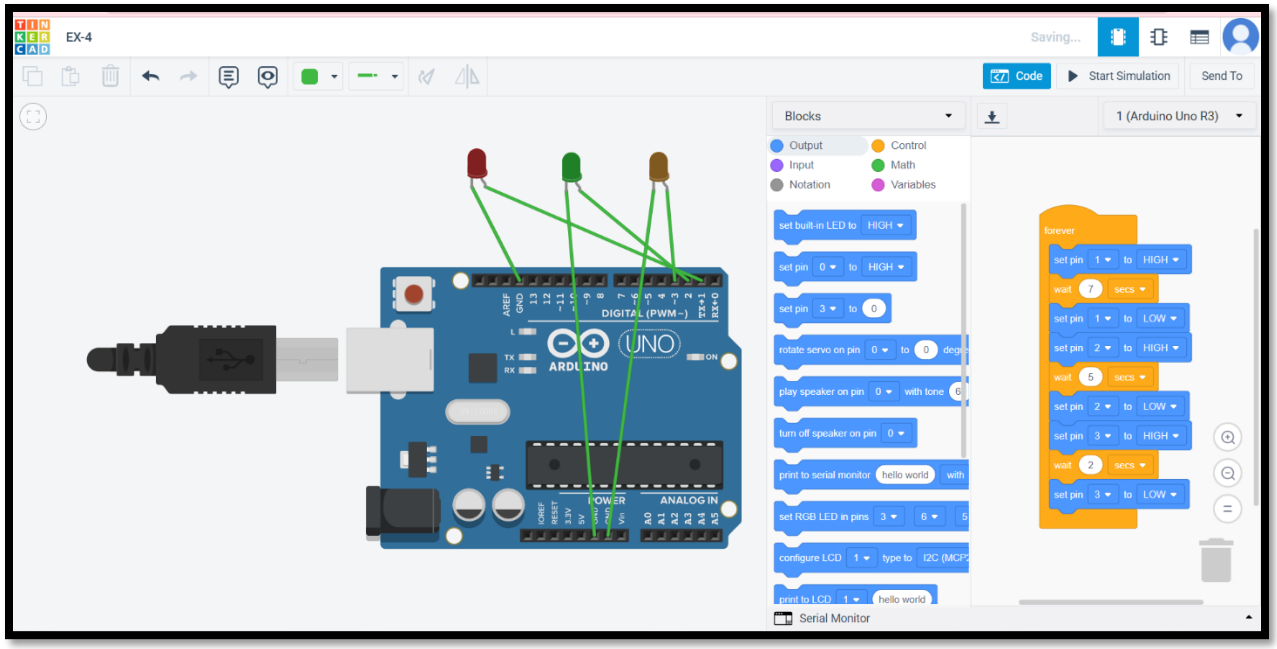
1. List of components used in practical:

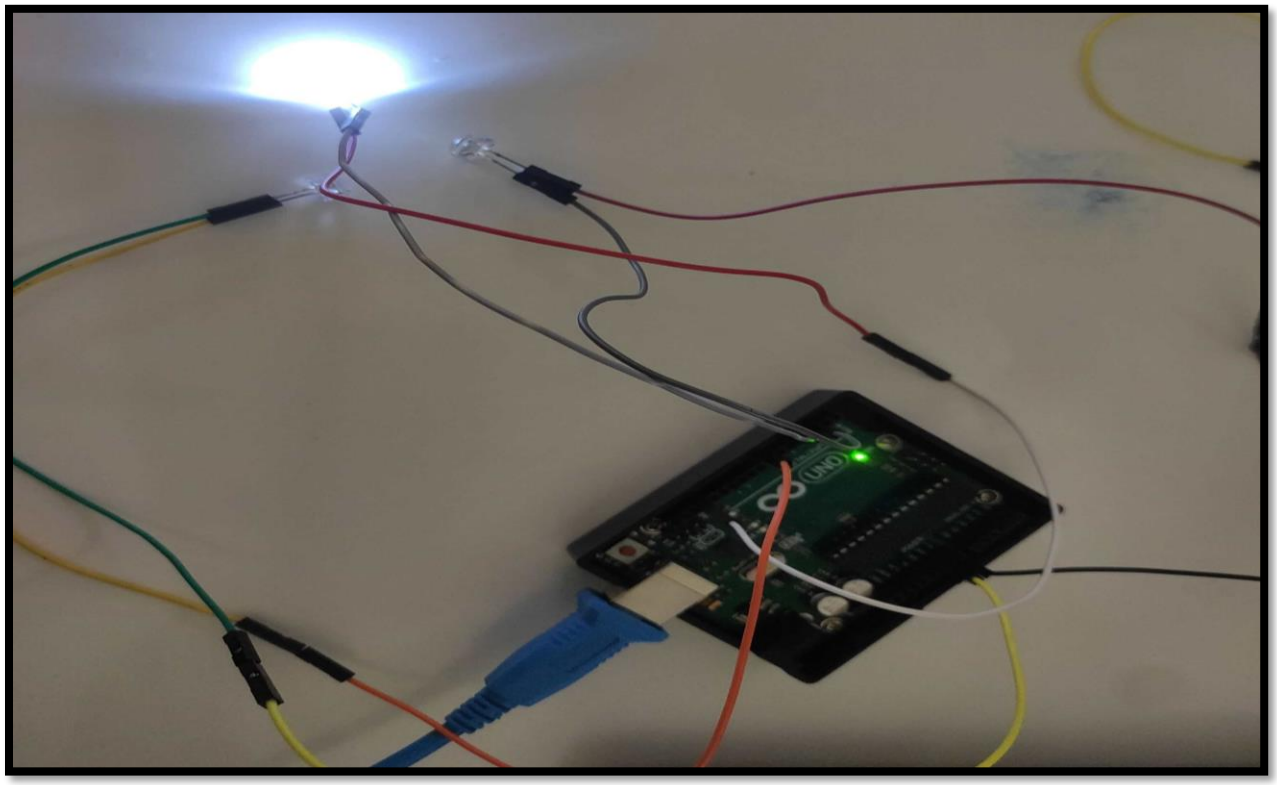
- Arduino Uno
- LEDs
- USB connector
- jumper wires
- Laptop

2. Steps to perform practical:

1. Write the code on your Arduino uno ide.
2. Take an Arduino uno, USB connector, LEDs, jumper wires.
3. Connect the cathode and anode of led with ground and pin no 1, 2, 3 with Arduino bord.
4. Connect the entire circuit with your laptop using USB connector.
5. Write a code for traffic management system in a Arduino IDE and code should control the LEDs to simulate a traffic signal system with a fixed time interval for each signal.
6. Upload your code into Arduino bord circuit.
7. Run the code and observe how the traffic signal sequence change.

3. Images/Screenshot:





4. Code:

```
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(1, OUTPUT);
   pinMode(2, OUTPUT);
    pinMode(3, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(1, HIGH);  // turn the LED on (HIGH is the voltage level)
  delay(7000);                    // wait for a second
  digitalWrite(1, LOW);
  digitalWrite(2, HIGH);   // turn the LED off by making the voltage LOW
  delay(5000);
  digitalWrite(2, LOW);
  digitalWrite(3, HIGH);
 delay(2000);
  digitalWrite(3, LOW);            // wait for a second
}
```

5. Analysis:

A traffic management system is a complex system that utilizes a range of technologies and techniques to manage traffic flow on roads, highways, and other transportation networks. Overall, a well-designed traffic management system can help reduce congestion, improve safety, and enhance the overall efficiency of our transportation networks.

6. Application:

- Traffic lights: The system controls the flow of traffic by turning on and off the red, yellow, and green LEDs in a predetermined sequence.
- Pedestrian crosswalks: Pedestrian crosswalks can help to prevent accidents and ensure that pedestrians have enough time to cross the road safely.
- Parking lots: A traffic management system using LEDs can be used in parking lots to guide drivers to available parking spaces.
- Construction sites: A traffic management system using LEDs can be used on construction sites to ensure the safety of workers and equipment.
- Highway toll booths: A traffic management system using LEDs can be used at highway toll booths to direct drivers to the correct lane and keep traffic moving efficiently.

Experiment 5

Title: Experiment using Arduino Uno to keep LED ON/OFF based on the moment of the object in the range of the PIR Motion Sensor.

Experiment Description:

Detecting motions or movements has always been important in most projects. With the help of the PIR Sensor, it has become very easy to detect human/animal movements. In this project, we will learn how we can interface a PIR Sensor with a microcontroller like Arduino. We will interface an Arduino with a PIR module and blink a LED whenever a movement is detected.

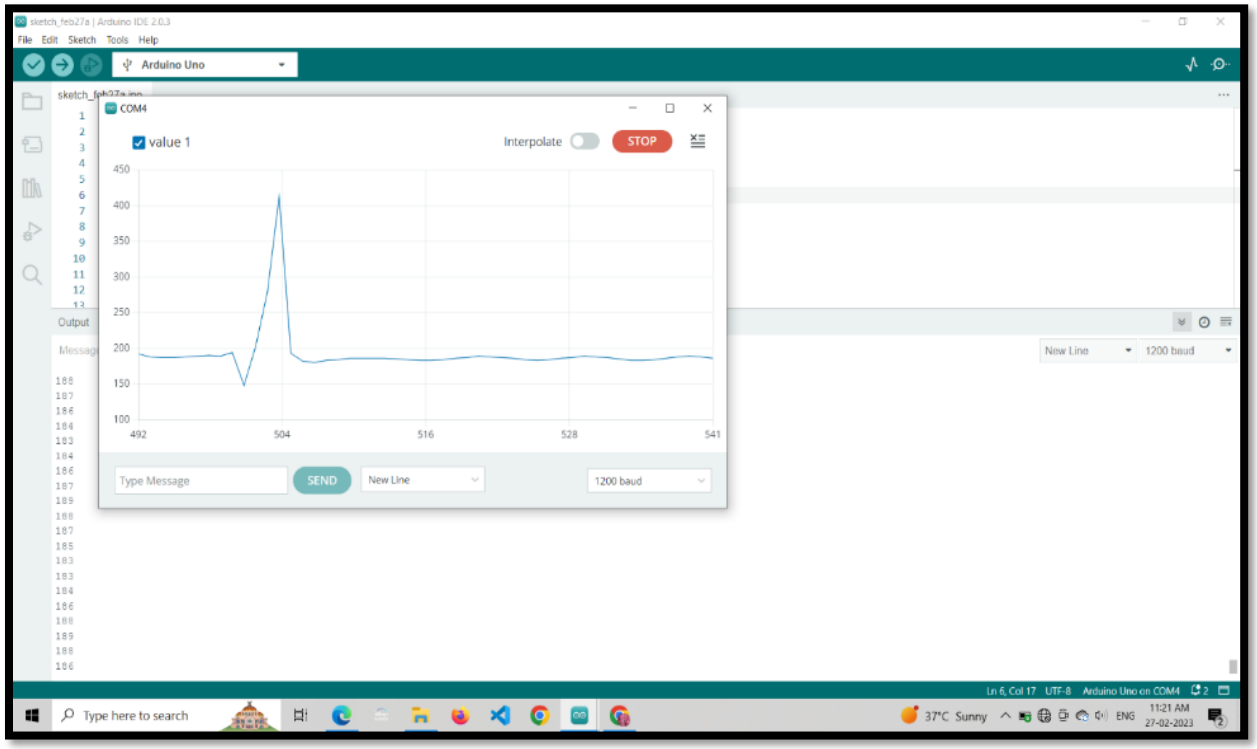
1. List of components used in practical:

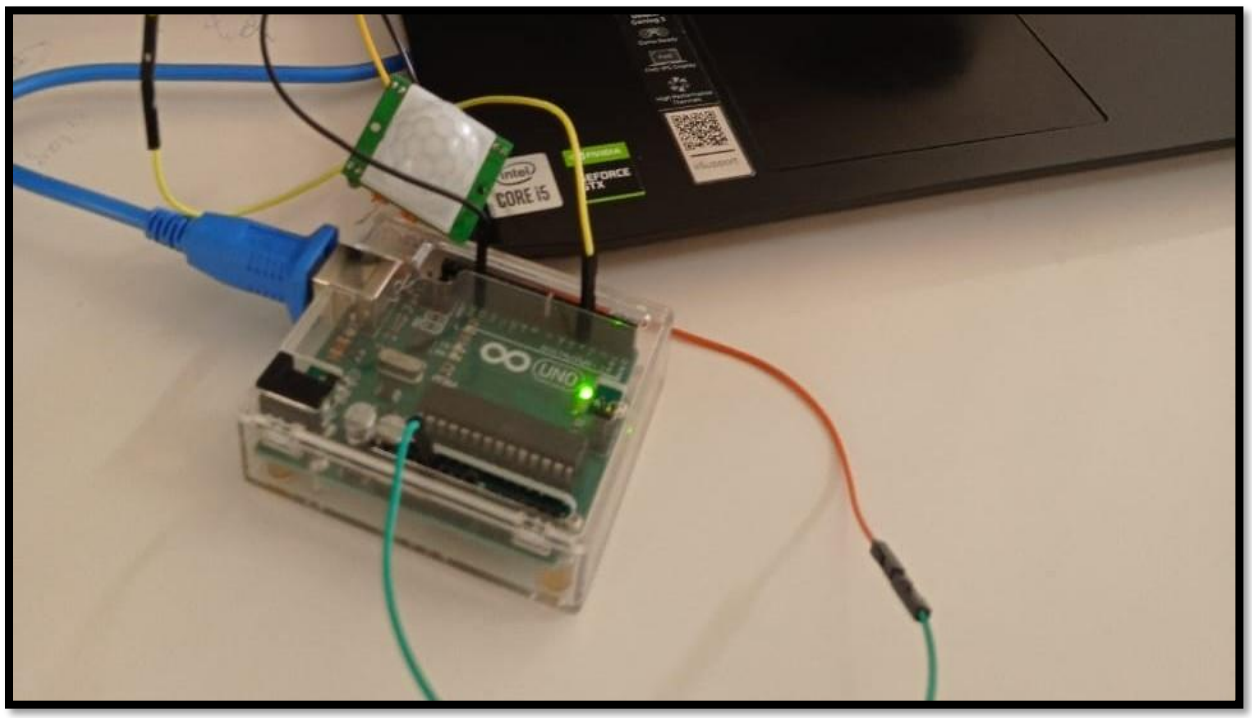
- Arduino Uno board
- PIR motion sensor
- Jumper wires
- USB connector
- Laptop

2. Step to perform practical Buzzer/LED ON/OFF:

1. Connect the PIR motion sensor to the Arduino board
2. Write the code.
3. Upload the code to the Arduino board.
4. Test the circuit
5. Move your hand or any object in front of the PIR motion sensor.
6. When you move away from the sensor the readings of the sensor will change from 0 to 1.

3. Screenshot reading/Image of circuit:





4. Code:

```
int i=0;
int a=0;
void setup()
{
  pinMode(4,INPUT);
  Serial.begin(9600);
}
void loop()
 {
  //i=digitalRead(8);
  a=analogRead(8);
  //Serial.println(i);
  Serial.println(a);
delay(1000);
}
```

5. Analysis:

The Arduino board receives a signal from the PIR motion sensor when an item enters its detection range, and the Arduino board then instructs the readings of the sensor will change from 0 to 1. The possible drawback is that only motion inside the PIR motion sensor's field of view is detected in this experiment. Moreover, the experiment only distinguishes between motion and no motion; it is unable to discern between other motions or objects. As a result, this experiment might not be appropriate for more sophisticated applications that need more accurate item recognition and discrimination.

Overall, the experiment using the Arduino Uno to maintain the readings of the sensor will change 0 or 1 based on the moment of an object in the range of the PIR Motion Sensor is a straightforward and practical application of the Arduino board that can be easily implemented for a variety of purposes, such as security systems, motion-activated lighting, and home automation.

6. Application:

- Application is frequently used in residences, workplaces, and other private spaces.
- PIR motion sensors can be used in home automation to switch on lights or other appliances when a person enters a room.
- PIR motion sensors can be used to track animal movement in a wildlife reserve, activating a camera or other recording device to take pictures or videos of the movement.
- May be used to activate automated doors so they open as a person approaches, making it simpler for those with impairments to enter public facilities.
- Robotics: To detect the presence of objects and modify the robot's movement accordingly, PIR motion sensors can be utilized in robotics.
- PIR motion sensors can be used in interactive art installations to activate various visual or aural effects as a visitor approaches. May be used in medical monitoring equipment to detect a patient's movement and activity level, which can be used to track a patient's progress and overall health.

Experiment 6

Title: Create a circuit using Arduino and sensors. Perform the experiment using Arduino Uno and Servo Motor based on sensor reading.

Experiment Description:

A Servo Motor is a small device that has an output shaft. This shaft can be positioned to specific angular positions by sending the servo a coded signal. As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft. Servos are extremely useful in robotics. The motors are small, have built-in control circuitry, and are extremely powerful for their size.

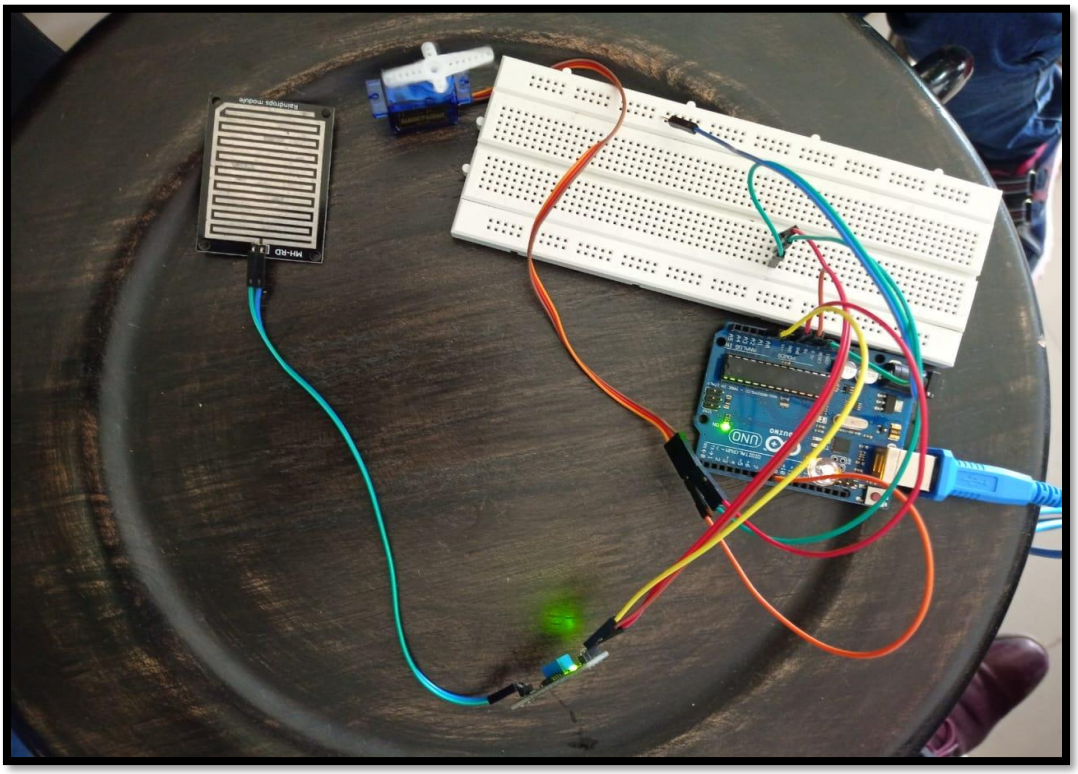
1. List of components used in practical:

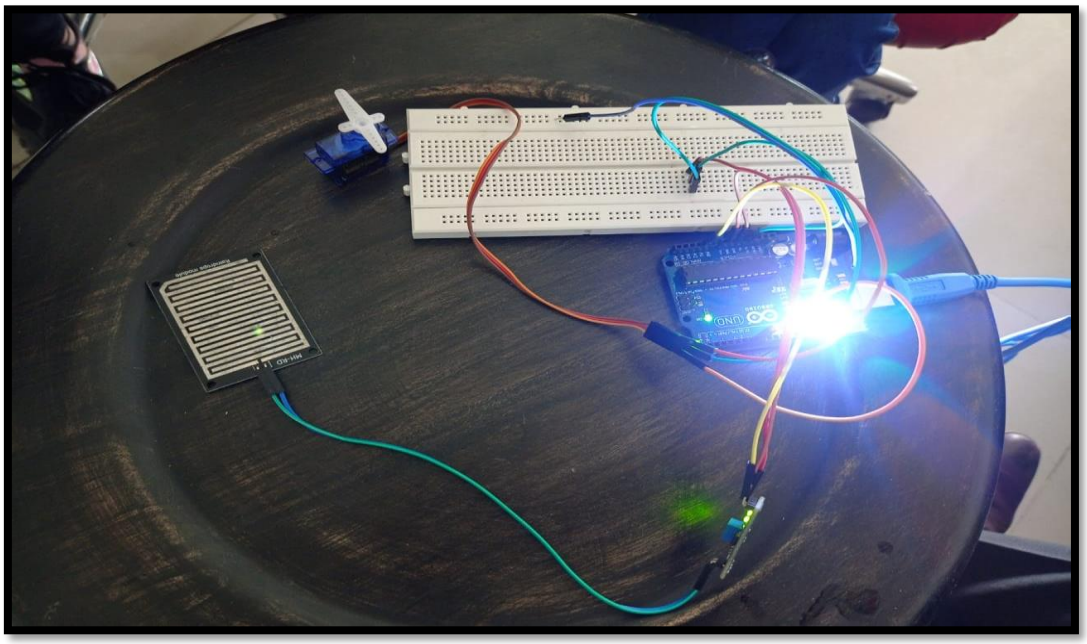
- Arduino Uno
- Servo Motor
- Raindrop sensor
- LED and jumper cables
- Bread Board
- Laptop.

2. Step to perform practical Servo Motor based on sensor reading:

1. Take one Arduino uno, connect servo motor with 3 wire connector in its 3 pins.
2. Out of 3 pins 1 pin will connect to the Arduino uno output pin (any from 1-13 pins). And other 2 pins will be connected to the bread board.
3. One pin will connect to the GND and one is for power supply.
4. For sensor reading we use rain drop sensor.
5. Rain drop sensor will have 3 pins too. One will connect to the input of the servo motor and one will connect to the power supply and remain one will connect to the bread board.
6. Now write the code logic in simulator for the same.
7. When sensor sense some rain drop on it, it will recat and send some data to the servo motor.
8. Now servo motor has some define point where it start rotating. Once it will reach at that point it will start rotating on given angle in the code.
9. Observe the rain drops on sensor and note down the rotation of servo motor.

3. Screenshot reading/Image of circuit:





4. Code:

```
#include <Servo.h>

Servo obj;

int a = 0;
int b = 15;
void setup() {
  // put your setup code here, to run once:
  pinMode(13, OUTPUT);
  pinMode(5, OUTPUT);

  pinMode(A1, INPUT);
  // pinMode(4,INPUT);
  Serial.begin(9600);
}

void loop() {
  // put your main code here, to run repeatedly:
  a = analogRead(A1);
  // b = digitalRead(4);

  Serial.println(a);
//  Serial.println(b);
  if(a<600){
    digitalWrite(13,HIGH);
    obj.write(0);
    delay(500);
    obj.write(90);
    delay(500);
  }
  else{
    digitalWrite(13,LOW);
  }
  delay(1000);
}
```

5. Analysis:

The goal of this exercise is to create a system that responds to changes in sensor readings by using an Arduino Uno, a servo motor, and a sensor. The purpose is to demonstrate the ability to control the servo motor's movement based on sensor input.

Finally, this experiment shows how to use an Arduino Uno to control the movement of a servo motor based on sensor readings. The system has a wide range of applications, including robotics, automation, and home automation. Additional enhancements can be developed to increase the system's performance and accuracy.

6. Application:

- Industries, that Use in machine tools, packaging, factory automation, material handling, printing converting, and assembly lines. In many other demanding applications robotics, CNC machinery, or automated manufacturing.
- Uses radio-controlled airplanes to control the positioning and movement of elevators.
- In robots because of their smooth switching on and off and accurate positioning.
- In the aerospace industry to maintain hydraulic fluid in their hydraulic systems.
- uses in many radio-controlled toys. used in automobiles to maintain speed of vehicles.
- used in electronic devices such as DVDs or Blue-ray Disc players to extend or replay the disc trays.

Experiment 7

Title: Experiment on Rain water identification system using Arduino Uno to keep Buzzer/LED ON/OFF based on the raining level [Using Raindrop sensor].

Experiment Description:

The Rain Detector Using Arduino and Raindrop Sensor is used to alert the surrounding when it's raining outside. The system is controlled with Arduino UNO. If the waterfalls on the Raindrop sensor it detects that it's raining outside and a led connected with it will glow and alert the surroundings. he dc motor starts moving when it rain and covers the roof s that rainwater can't come inside the home in this Arduino project.

1. List of components used in practical:

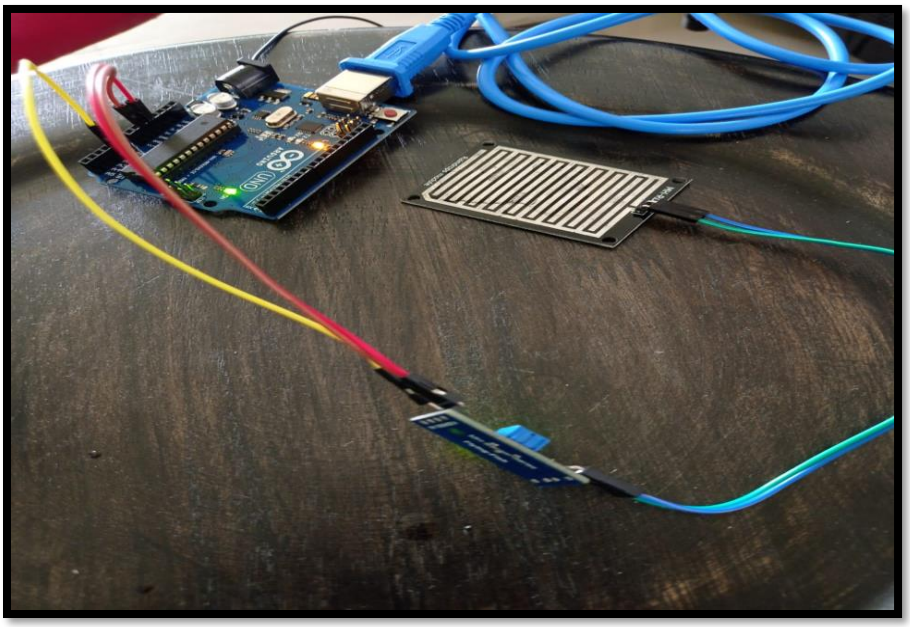
- Arduino Uno
- Servo Motor
- Raindrop sensor
- LED and jumper cables
- Bread Board
- Laptop.

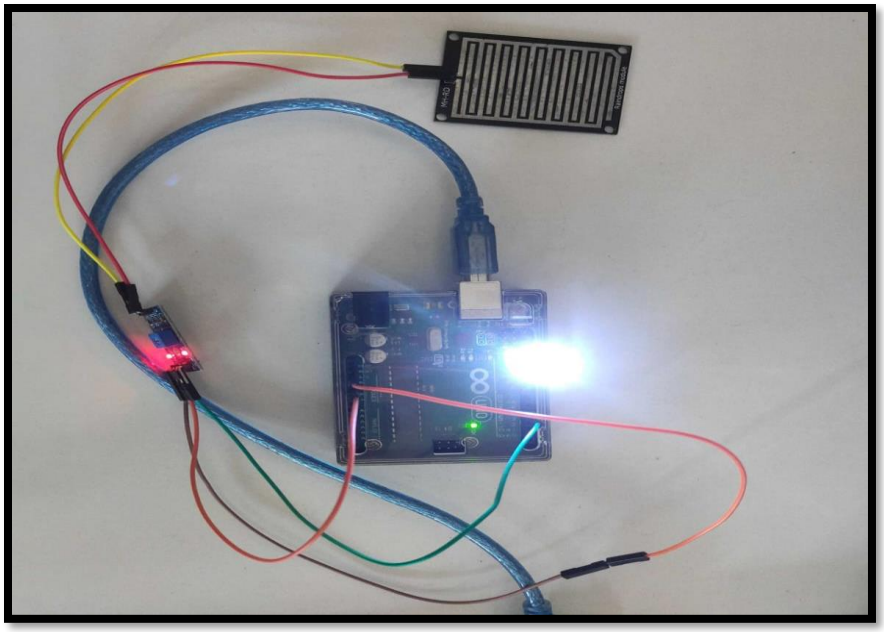
2. Step to perform practical Servo Motor based on sensor reading:

1. Take one Arduino uno, connect rain drop sensor with 3 wire connector in its 3 pins.
2. Out of 3 pins 1 pin will connect to the Arduino uno input pin (any from 1-13 pins). And other 2 pins will be connected to the Arduino uno.
3. One pin will connect to the GND and one is for power supply.
4. For identification of rain drop sensor we use one led.
5. Connect the led to the Arduino uno pin in any of 1-13.
6. Its input pin will be the output pin of the rain drop sensor.
7. Rain drop sensor will have 3 pins too. One will connect to the input of the led and one will connect to the power supply and remain one will connect to the GND
8. Now write the code logic in simulator for the same.
9. When sensor sense some rain drop on it, it will recat and send some data to the Arduino uno.

10. Now led will blink according to your code logic once it will gate the input from the rain drop sensor.
11. Observe the rain drops on sensor and take a note of blinking led.

3. Screenshot reading/Image of circuit:





4. Code:

```
int a = 0
int b= 15;
void setup() (
// put your setup code here, to run once:
pinmode(13, OUTPUT);
// pinMode(A1, INPUT);
pinMode(4,INPUT);
Serial.begin(9600);
void loop() [
// put your main code here, to run repeatedly:
// a = analogRead(A1);
b= digitalRead(4);
// Serial.println(a);
Serial.printin(b);
if(a<600)(
digitalwrite(13,HIG);
elsef
digitalwrite(13,L0N);
delay(1000);
```

5. Analysis:

The purpose of this experiment is to use an Arduino Uno, a raindrop sensor, and either a buzzer or an LED to develop a system that recognizes raindrops and indicates its intensity. After gathering the data, it can be analyzed to assess how well the system is working. Based on your data analysis, you can draw some conclusions about the experiment. You may learn that the device is capable of detecting rain and calculating rainfall intensity. You might also see areas where the system could be improved, such as by adding a more sensitive raindrop sensor or a more powerful buzzer or LED.

Lastly, this experiment demonstrates the ability to identify raindrops and show the severity of rainfall using an Arduino Uno, a raindrop sensor, and either a buzzer or an LED. The technology can be used for a variety of purposes, including weather monitoring and agriculture. Further improvements can be made to improve the accuracy and functionality of the system.

6. Application:

- This sensor is used as a water preservation device and this is connected to the irrigation system to shut down the system in the event of rainfall.
- This sensor is used to guard the internal parts of an automobile against the fall as well as to support the regular windscreen wiper's mode.
- This sensor is used in specialized satellite communications aerials for activating a rain blower over the opening of the aerial feed, to get rid of water droplets from the mylar wrap to keep pressurized as well as dry air within the waveguides.

Experiment 8

Title: Experiment on Laboratory temperature management system using Arduino Uno to keep Buzzer/LED ON/OFF based on the temperature value. [using Temperature sensor].

Experiment Description:

Using an Arduino Uno to control a buzzer or LED in accordance with the temperature, experiment with a laboratory temperature management system. utilizing a temperature sensor.

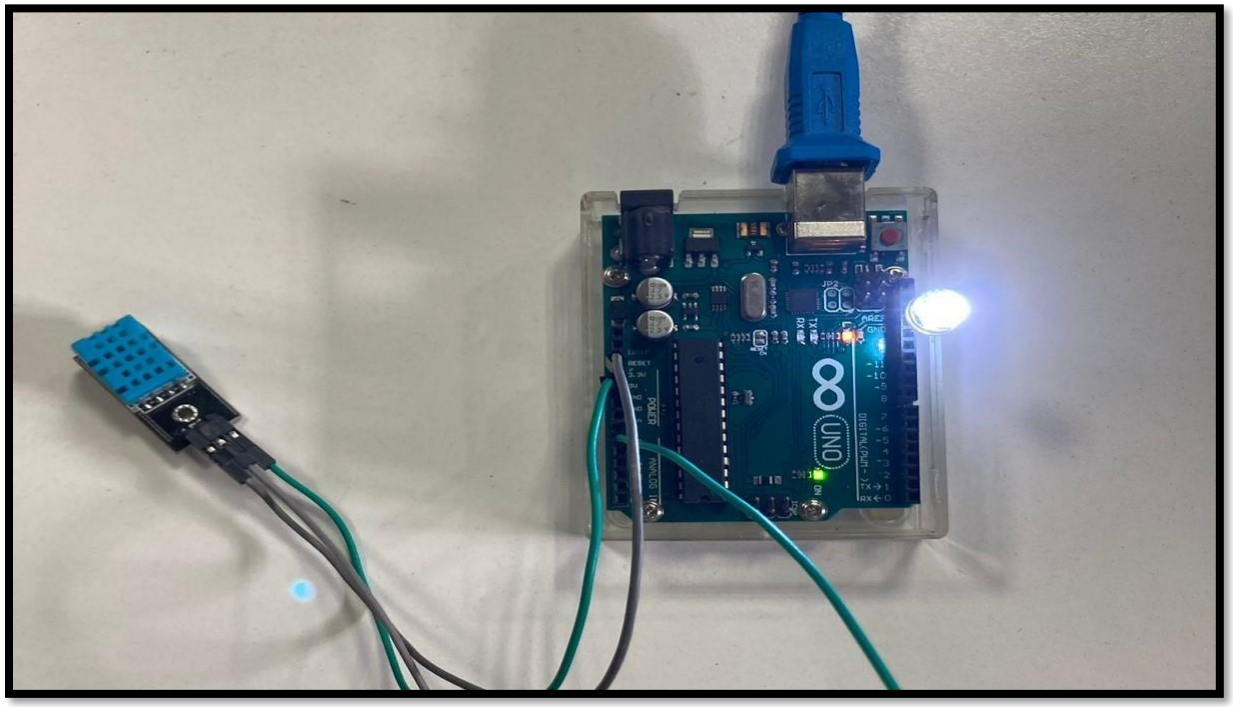
1. List of Components:

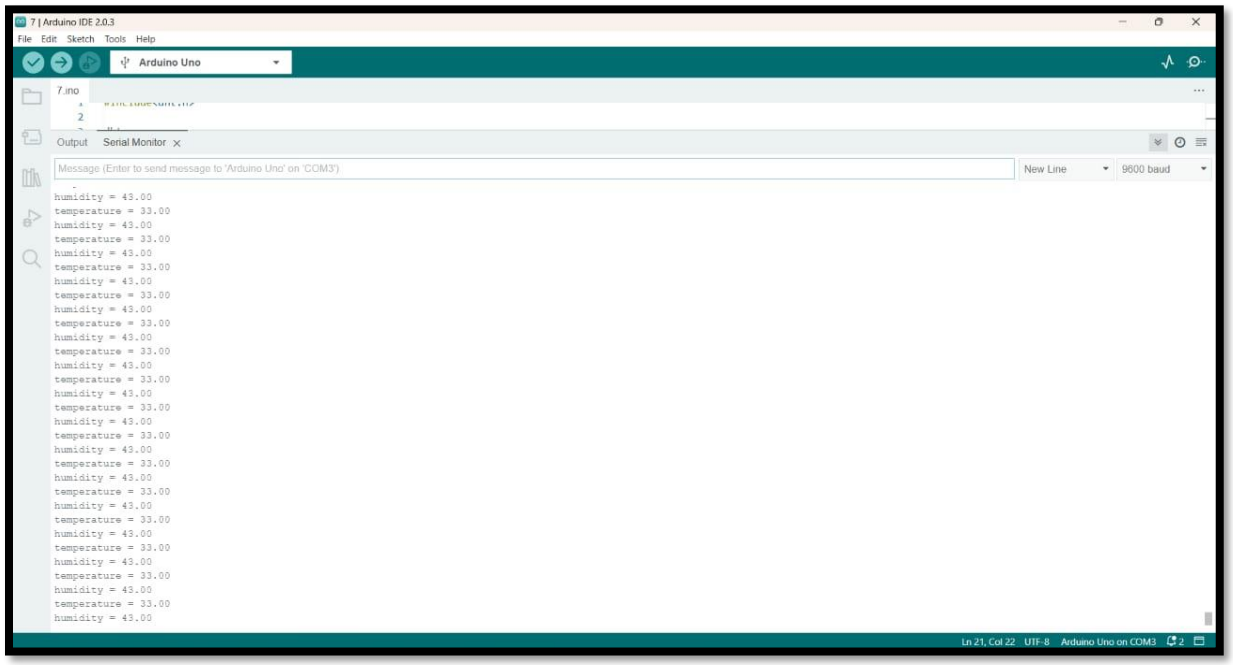
- Arduino UNO Microcontroller
- LED
- Jumper Cables
- USB Connector
- Laptop
- Temperature Sensor

2. Experiment Steps:

1. Connect the two pins from the Sensor to the two pins on the Amplifier circuit via hook-up wires.
2. Connect the Vcc from the Amplifier to the 3.3V pin on the Arduino.
3. Connect the Gnd pin to the Gnd pin on the Arduino.
4. Connect the longer LED leg to pin 13 on the Arduino.
5. Now connect the Analog Data Pin to the A0 pin on the Arduino (Since I'm interested in Analog Data).
6. Write a code for the Laboratory temperature management system in a Araduino IDE.
7. Upload your code into the Arduino board circuit.
8. After verifying the code, upload it to the board and open the serial monitor. You will see the sensor data on the monitor is changed.

3. Screenshot reading/Image of circuit:





4. Code:

```
#include<dht.h>
dht a;
void setup() {
  // put your setup code here, to run once:
pinMode(13,OUTPUT);
Serial.begin(9600);
}

void loop() {
 // put your main code here, to run repeatedly:
a.read11(A0);
Serial.print("temperature = ");
Serial.println(a.temperature);
Serial.print("humidity = ");
Serial.println(a.humidity);
if(a.temperature >=30){
// turn on LED
digitalWrite(13,HIGH);
// delay(1000);
}
else{
// turn of LED
digitalWrite(13,LOW);
// delay(1000);
}
delay(1000);
}
```

5. Analysis:

This project uses an Arduino Uno microcontroller and a temperature sensor. One LED and a buzzer that activates at the appropriate temperature are included. Moreover, it has a temperature sensor that measures temperature using an temperature sensor and an Arduino Uno microprocessor. The buzzer plays and the LED blinks as directed by the code that is set up in the Arduino software to accept the analogue data from the temperature sensor.

6. Application:

- This sensor is used to automize the colling system in many homes and offices where the air conditioner will turn on if the temperature is too high and heater will turn on if temperature is too low.
- This sensor can also be used to check the quality of some food and vegetables or to monitor their ripeness over time and give it a certain temperature using some control medium as some most of the fruits and vegetables release heat when they ripen.
- This sensor is also used for green house farming of certain crops which are very susceptible to temperature changes.

Experiment 9

Title: : Experiment on Soil Moisture identification system using Arduino Uno to keep Buzzer/LED ON/OFF based on the soil moisture level [Using Moisture sensor].

Experiment Description:

The soil moisture sensor consists of two probes that are used to measure the volumetric content of water. The two probes allow the current to pass through the soil, which gives the resistance value to measure the moisture value.

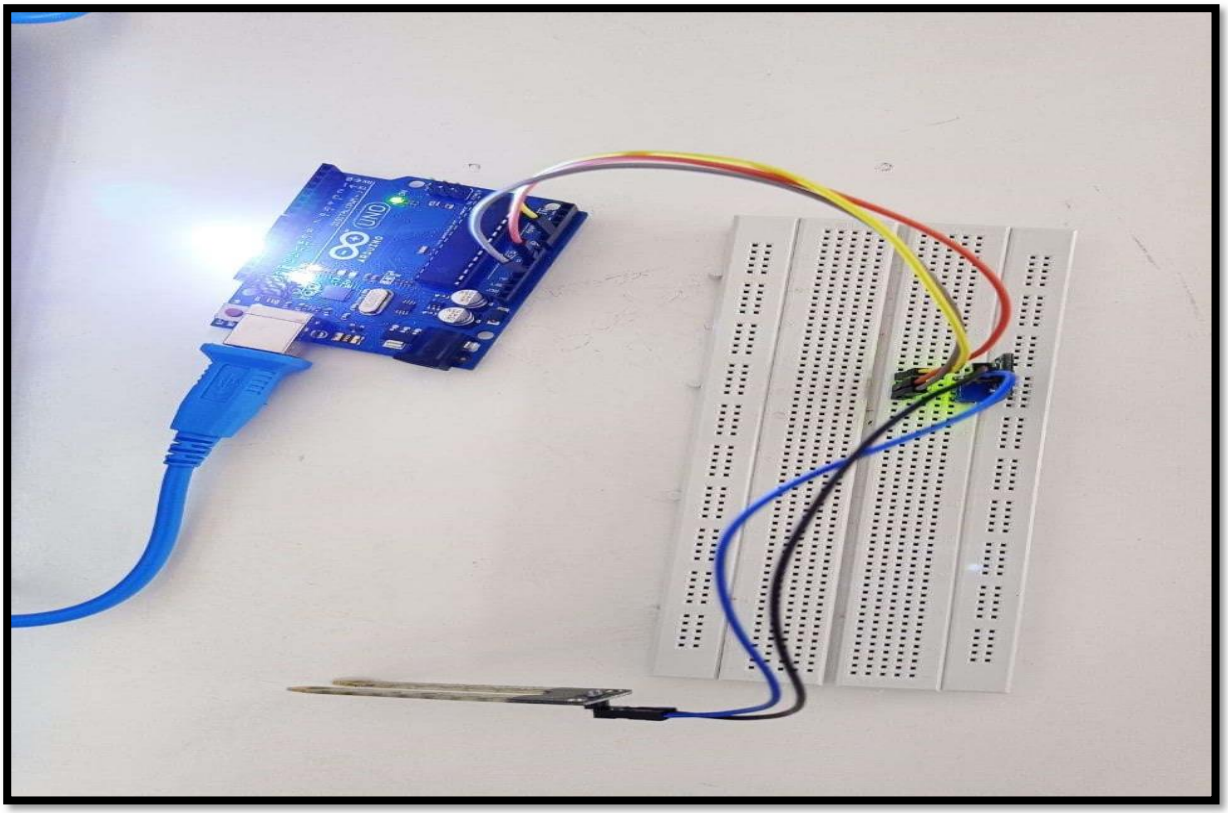
1. List of components used in practical:

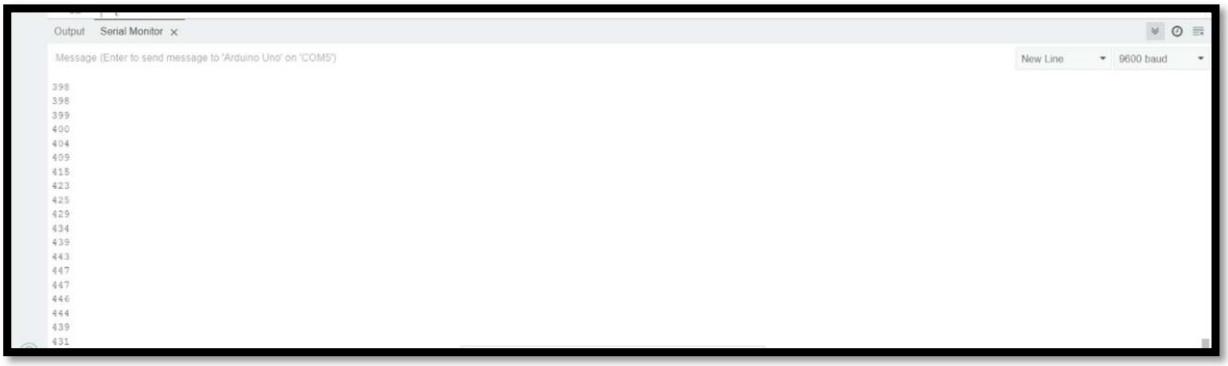
- Arduino Uno board
- Moisture Sensor
- Jumper wires
- LEDs(R,G,Y)
- Comparator
- USB connector
- Laptop

2. Step to perform practical Buzzer/LED ON/OFF:

1. Connect the two pins from the Sensor to the two pins on the Amplifier circuit via hook up wires.
2. Connect the Vcc from the Amplifier to the 3.3V pin on the Arduino and the Gnd pin to the Gnd pin on the Arduino.
3. Now connect the Analog Data Pin to the A0 pin on the Arduino (Since I'm interested in Analog Data).
4. After verifying the code, upload it to the board and open the serial monitor. You will see the sensor data on the monitor being changed when you dip the sensor leads in water and when dry.

3. Screenshot reading/Image of circuit:





4. Code:

```
int i=0; void
setup() {
// put your setup code here, to run once:
Serial.begin(9600); pinMode(A0,INPUT);
pinMode(13,OUTPUT);
}
void loop() {
// put your main code here, to run repeatedly:
i = analogRead(A0);
Serial.println(i); if(i>420) {
digitalWrite(13,HIGH);
}
else{
digitalWrite(13,LOW);
}
delay(1000);
}
```

5. Analysis:

The amount of water in the soil is essentially measured by its moisture content. A soil moisture sensor that comprises of two conducting probes that function as a probe can be used to measure this. Based on the variation in resistance between the two conducting plates, it can calculate the soil moisture content. The amount of moisture in the soil has an inverse relationship with the resistance between the two conducting plates.

6. Application:

- Agriculture
- Landscape irrigation
- Research
- Simple sensors for gardener

Experiment 10

Title: : Experiment on Soil Moisture identification system using Arduino Uno to keep Buzzer/LED ON/OFF based on the soil moisture level [Using Moisture sensor].

Experiment Description:

The soil moisture sensor consists of two probes that are used to measure the volumetric content of water. The two probes allow the current to pass through the soil, which gives the resistance value to measure the moisture value.

1. List of components used in practical:

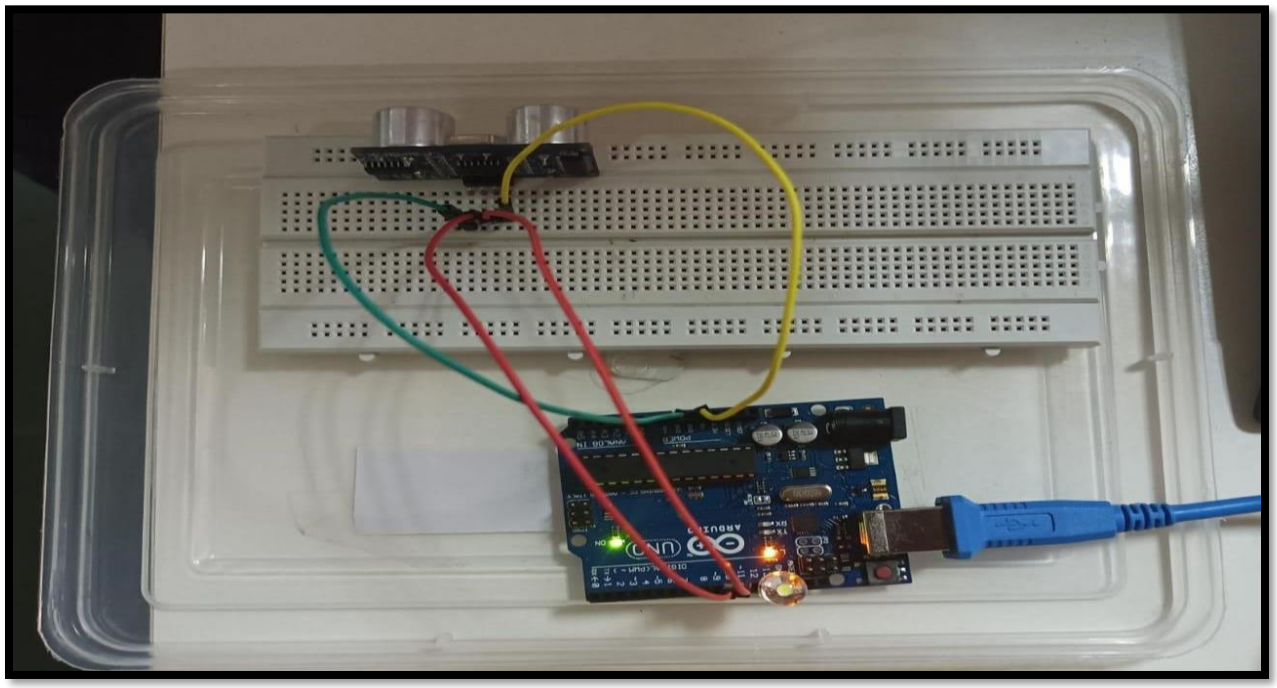
- Arduino Uno board
- Ultrasonic Sensor
- Jumper wires
- LEDs(R,G,Y)
- Comparator
- Breadboard
- USB connector
- Laptop

2. Step to perform practical Buzzer/LED ON/OFF:

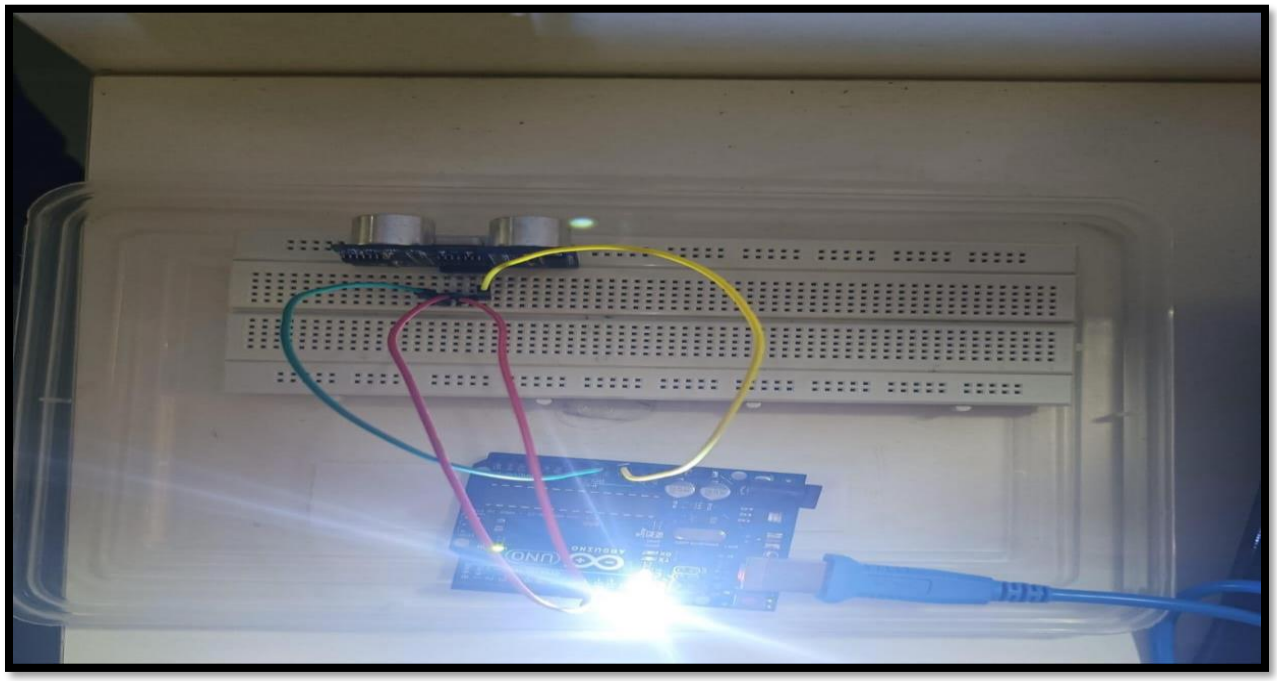
1. Connect the Echo pin of the sensor to the 10 pin of the Arduino.
2. Connect the Trig pin of the sensor to the 11 pin of the Arduino. Navigate to Tools and select board and port.
3. Verify and compile the code, then upload the code to the Arduino Uno R3 board.
4. Monitor the output in the Serial monitor (Set the baud rate as 9600).

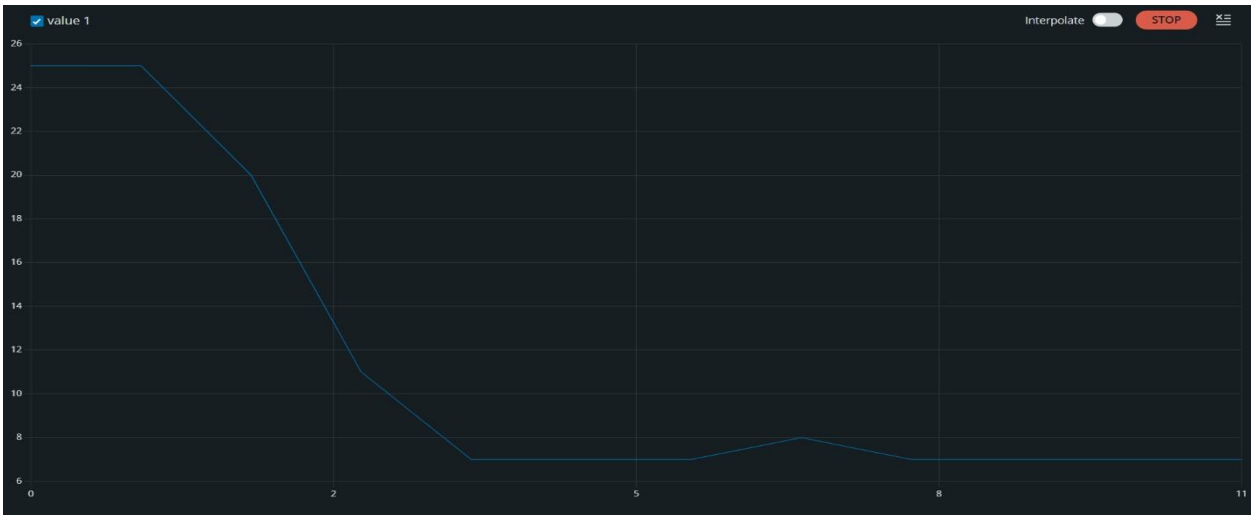
3. Screenshot reading/Image of circuit:

If disctance is >10



If distance is <= 10





4. Code:

```
int trigPin=11; int echoPin=10;
int led=12;
void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);   pinMode(led, OUTPUT);   pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
}
```

```
void loop() {

  // put your main code here, to run repeatedly:   long duration, distance;

digitalWrite(trigPin, HIGH);
delayMicroseconds(1000);
digitalWrite(trigPin, LOW);
duration=pulseIn(echoPin, HIGH);
distance=(duration/2)/29.1;
Serial.print(distance);
Serial.println("CM");
delay(10);

if(distance<=10) {
digitalWrite(led, HIGH);
}else{
digitalWrite(led, LOW);
}
delay(1000);
}
```

5. Analysis:

The In order to determine distance, ultrasonic sensors transmit and receive ultrasonic waves. A sender that emits ultrasonic waves and a receiver that picks them up make up an ultrasonic sensor. The transmitted ultrasonic wave moves through the atmosphere before striking the Object and being reflected. Arduino determines how long it takes for an ultrasonic pulse wave to travel from the sender to the receiver.
We know that the speed of sound in air is nearly 344 m/s.
Formula: Distance = Speed * Time Distance
= (duration/2)/29.1

6. Application:

- Used in RADAR system.
- To measure distance without physical contact with measuring instruments.
- Used in object detection for security purposes.