DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

NAAC GRADE A+
Accredited University

Experiment- 3.2

Student Name: **Anmol Ray** **UID: 21BCS1816**
Branch: **CSE** **Section/Group: 21BCS_IOT_610-A**
Semester: **05** **Date of Performance: /10/23**
Subject Name: **Internet of Things Lab** **Subject Code: 21CSP-344**

Aim: Case study of Agriculture 4.0 using IoT and to develop an IoT model for the agriculture sector**.**

Objective:

To do a case study of Agriculture 4.0 and we have to develop a smart model for agriculturesector. Resource Optimization: Efficiently utilize resources such as water, fertilizer, and energy by leveraging data and automation.

Sustainability: Implement practices that reduce environmental impact and promote sustainable agriculture.

Data-Driven Decision-Making: Enable farmers to make informed decisions based on real-time and historical data.

Components Required:

- 1 Arduino UNO
- 1 Resistor 1k ohm
- Jumper Wires
- Soil Moisture Sensor
- NPK Sensor
- Temperature and Humidity sensor

Case Study:

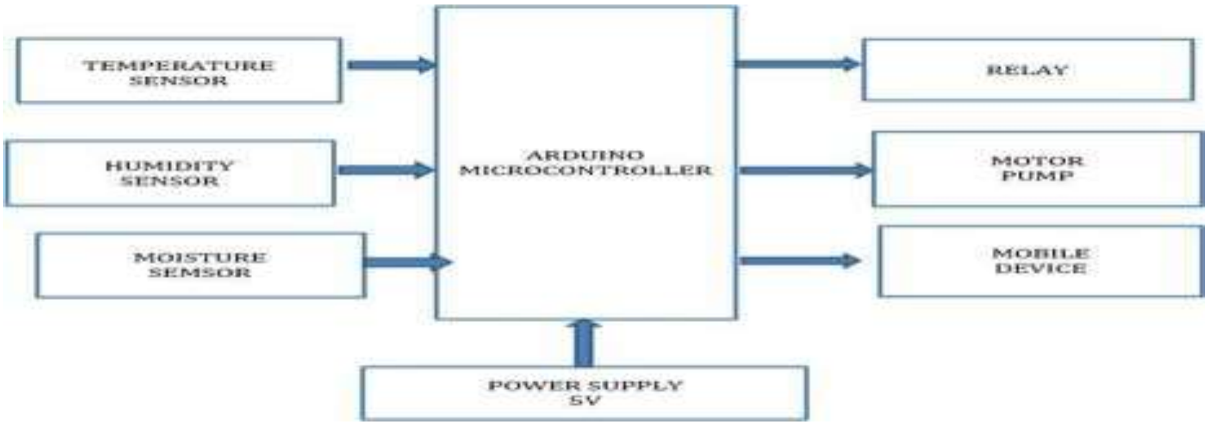
India is mainly an agricultural country. Agriculture is the most important occupation for the most of the Indian families. It plays vital role in the development of agricultural country. In India, agriculture contributes about16% of total GDP and 10% of total exports. Water is main resource for Agriculture. Irrigation is one method to supply water but in some cases there will be lot of water wastage. So, in this regard to save water and time we have proposed project titled smart irrigation system using IoT. In this proposed system we are using various sensors like temperature, humidity, soil moisture sensors which senses the various parameters of the soil and based on soil moisture value land gets automatically irrigated by ON/OFF of the motor. These sensed parameters and motor status would be displayed on user android application.

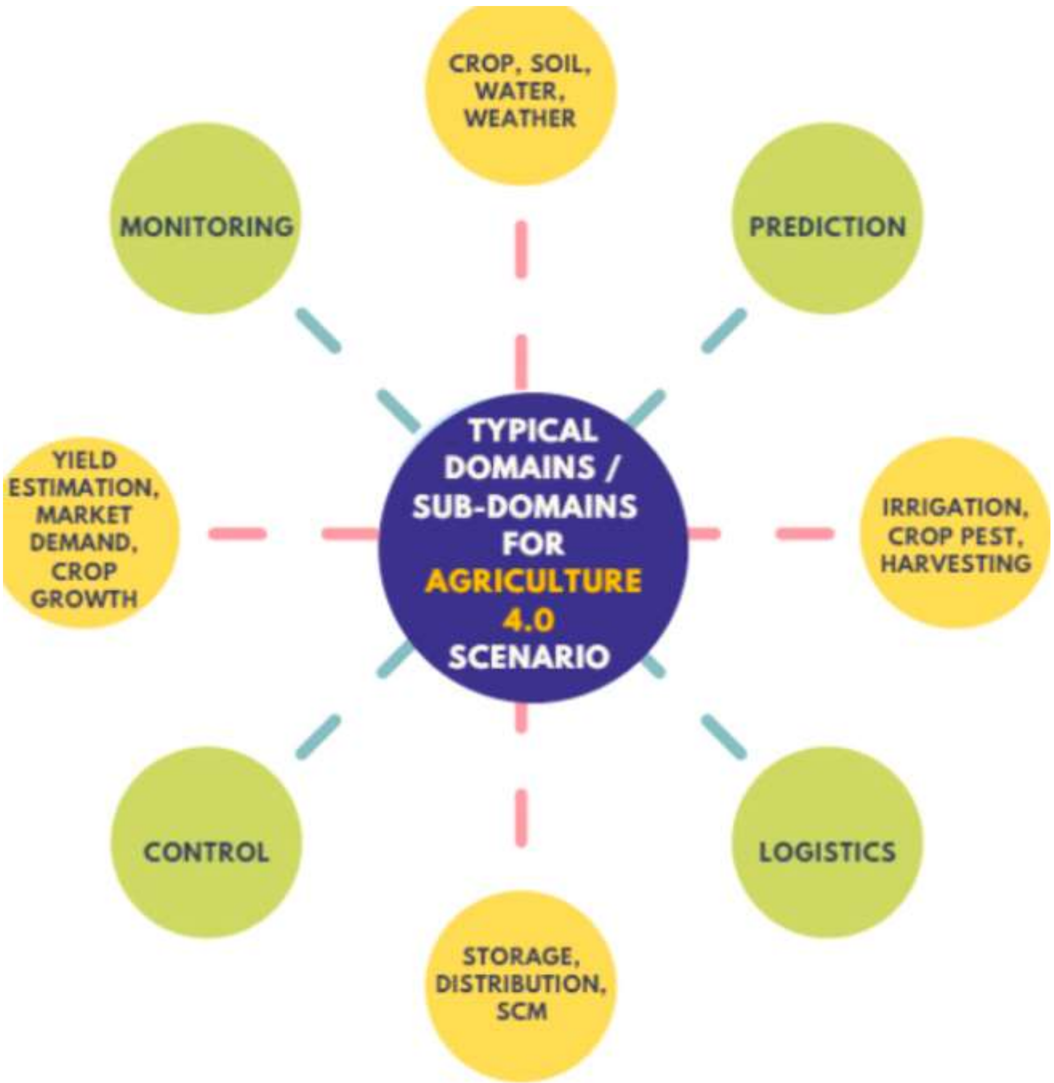
Introduction:

With India's population crossing 1.3 billion in 2016, a balance between the optimum population growth and a healthy of nation is far to be achieved. The rising population, there is a need for increased agricultural production. Irrigated agriculture has been an extremely important source increased agricultural production. Now a days people wants to observe their work from anywhere on their digital devices such as Smartphone and tablet or laptop. Several things were made easy by using Internet of Thing (IoT). This seminar on "IOT base smart irrigation system" is for to create an IOT base automated irrigation mechanism, which turns the pumping motor ON, and OFF on detecting the moisture content and sufficient water level and pass data through IOT platform. It overcome labour intensive work and also controls water management system.

Proposed System:

All the sensors i.e. moisture sensor, humidity sensor, temperature sensor, is connected to the microcontroller 5volts of power is supplied to the micro controller. From that microcontroller a relay gets the information about the percent of the moisture in the soil. If the moisture percent 15 is low then the motor gets automatically ON and the notification is sent to the user device. Block diagram of Arduino based smart irrigation system which consist of three sensors, which are connected to controller and sensed values from these sensors are send to the mobile application.





Procedure:

1. **Set Up Your Tinkercad Environment:**

- Open Tinkercad and create a new project.
- Drag and drop the following components onto your work area: Arduino board and soil moisture sensor.

2. **Connect the Soil Moisture Sensor:**

- Connect the VCC (Power) pin of the soil moisture sensor to the 5V pin on the Arduino.
- Connect the GND (Ground) pin of the soil moisture sensor to the GND pin on the Arduino.
- Connect the analog output pin of the soil moisture sensor to an analog input pin on the Arduino (e.g., A0).

3. **Make Additional Connections:**

- Ensure all components are securely connected to the breadboard or your custom PCB.

4. **Arduino Code:**

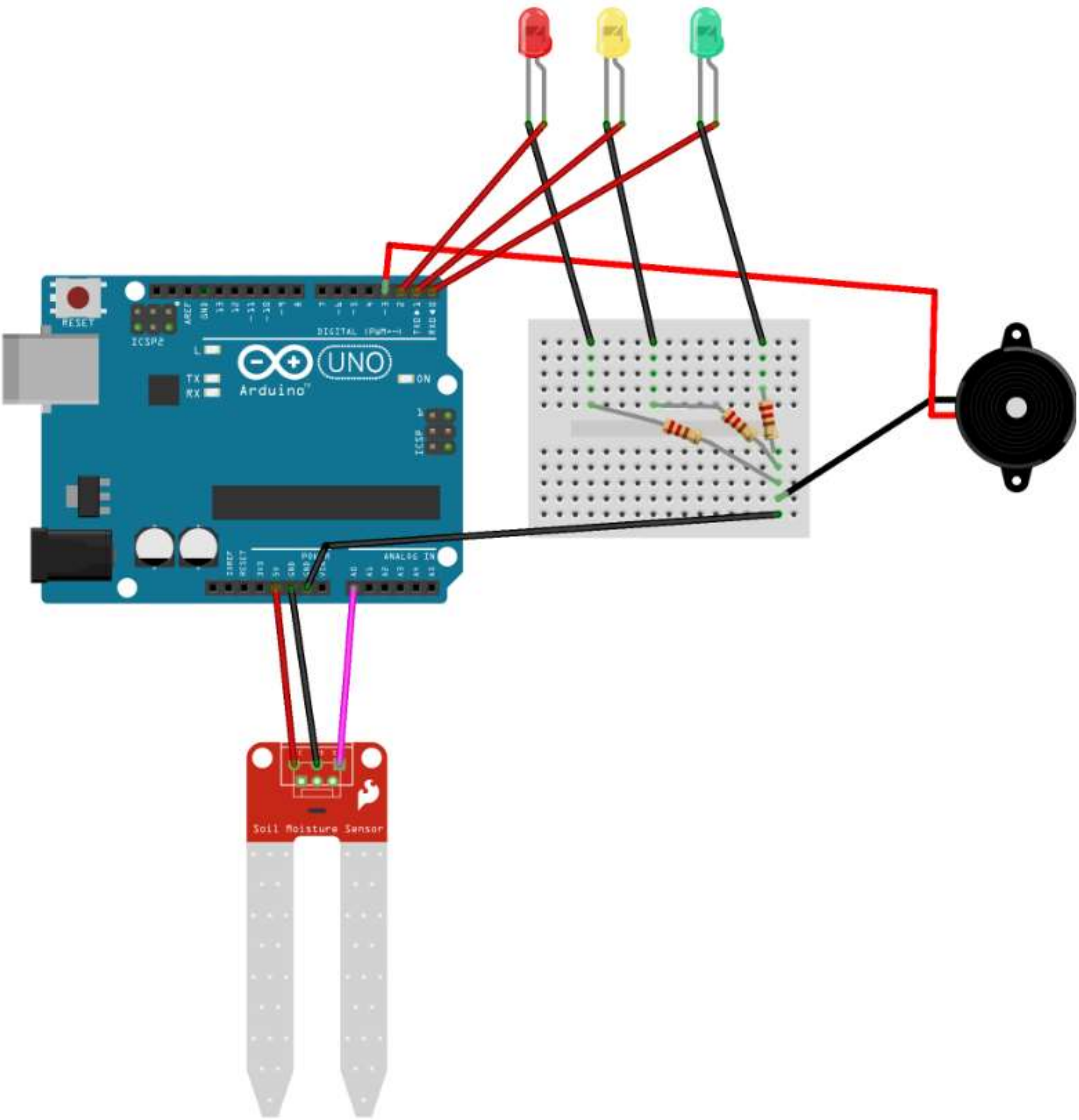
- Write the Arduino code to read and monitor the soil moisture level.

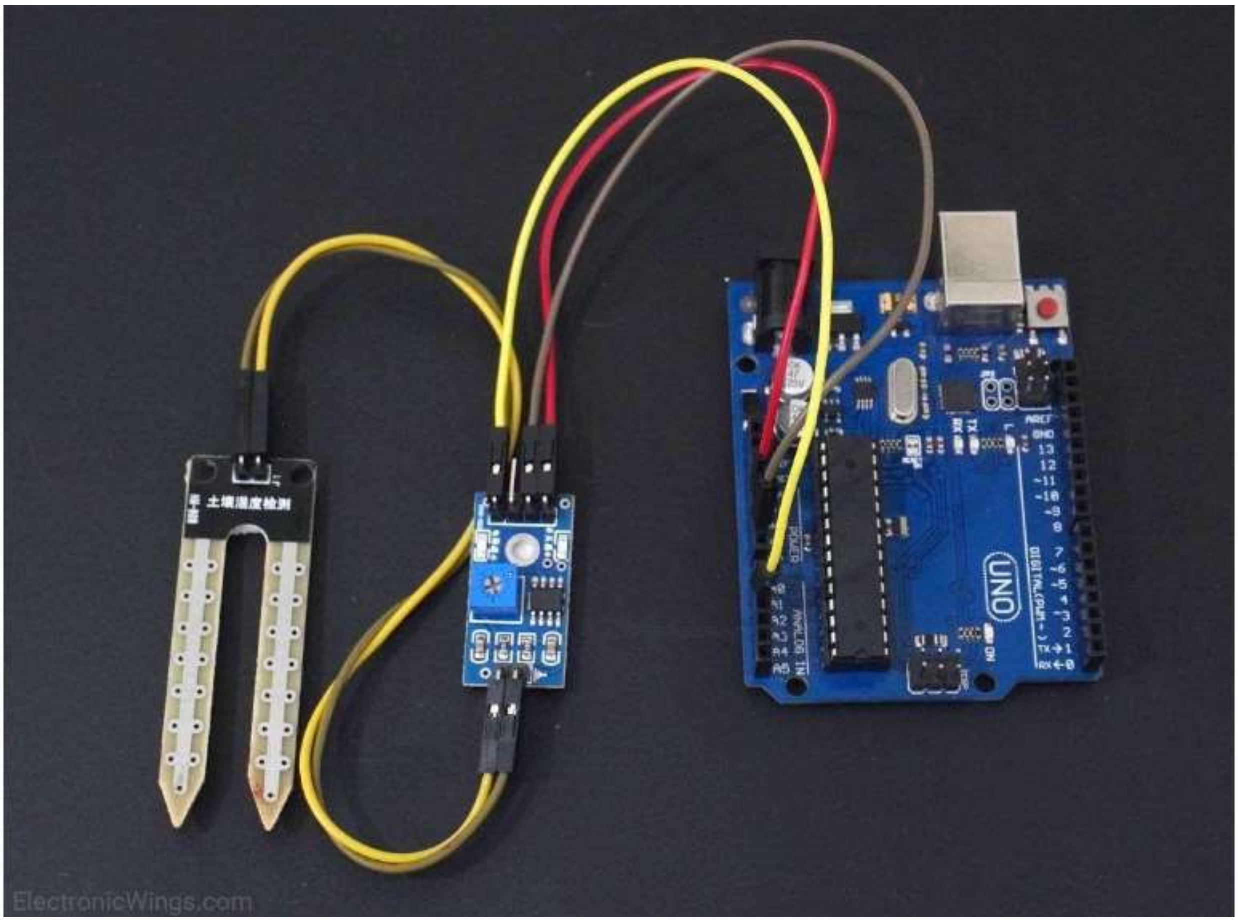
CODE:

```
const int sensorpin = A0;
const int sensorpower = 8;
const int LED1 = 2;
const int LED2 = 3;
const int LED3 = 4;
int sensor;
const int delayTime = 1000;

int wet = 800;
int dry = 500;

void setup(){ // code that only runs once
  // set pins as outputs
  pinMode(LED1,OUTPUT);
  pinMode(LED2,OUTPUT);
  pinMode(LED3,OUTPUT);
  pinMode(sensorpower,OUTPUT);

  // initialize serial communication
  Serial.begin(9600);
}

void loop(){ // code that loops forever
  // power on sensor and wait briefly
  digitalWrite(sensorpower,HIGH);
  delay(10);
  // take reading from sensor
  sensor = analogRead(sensorpin);
  // turn sensor off to help prevent corrosion
  digitalWrite(sensorpower,LOW);

  // print sensor reading
  Serial.println(sensor);

  if(sensor>wet){
    digitalWrite(LED1,LOW);


 digitalWrite(LED2,LOW);
    digitalWrite(LED3,HIGH);
```

```
  }
  else if(sensor<dry){
    digitalWrite(LED1,HIGH);
    digitalWrite(LED2,LOW);
    digitalWrite(LED3,LOW);
  }
  else{
    digitalWrite(LED1,LOW);
    digitalWrite(LED2,HIGH);
    digitalWrite(LED3,LOW);
  }
  delay(delayTime);

}ghlgh
```

Screenshot :





Test Result:

The Smart Irrigation System is integrated into the mobile application system to enable the user to easily monitor and control the irrigation of the farm field. On the mobile application system, there is an interface to view data collected directly from the sensors via the help of the Firebase, which is the cloud that creates a bridge between hardware and the cloud database. The main interface of the mobile application is the main menu that displays the login page of the system. This is to create a secured login for each user and to prevent others from knowing data owned by another client. Once the user successfully login to the app, there is another menu display the options control the irrigation system. The user has to select any of the options to go about the system. The control option leads the user to control the water pump to either force "ON" or "OFF", or just set it to the AUTO mode where it navigates the pump's control based on the sensor's value that set in the system. Then, the control system leads the user to access the BLYNK App. This process is to display percentage of all the sensors, which display the report of the status of the farm field's soil. The flow of the Smart Irrigation System that integrated into the mobile application system.

Conclusion

1) We conclude that this system is easy to implement and time, money and manpower saving solution for irrigating fields.

2) A farmer should visualize his agricultural land’s moisture content from time to time and water level of source is sufficient or not. IOT based smart irrigation system displays the values of the sensors continuously in smart phone or on computer’s web page and farmer can operate them anytime from and anywhere.

mart farming is highly efficient when compared with the conventional approach.

Analysis:

Data-Driven Farming: IoT sensors for soil, weather, and crop health provide a wealth of data. This data is collected and analyzed to deliver actionable insights, helping farmers make informed decisions. The ability to tailor farming practices to specific conditions can significantly impact crop yield and resource management.

Precision Agriculture: Precision agriculture is made possible through the IoT model. Automation systems can precisely control irrigation and fertilization based on real-time data. This not only enhances resource efficiency but also minimizes human error.
Sustainability and Environmental Impact: By promoting sustainable farming practices, such as no-till farming and organic farming, the IoT model reduces the environmental impact of agriculture. Sustainable practices not only contribute to environmental preservation but also align with consumer preferences for eco-friendly products.
Resource Efficiency: The model optimizes resource utilization, which is critical for both cost savings and environmental protection. Efficient water and fertilizer use can reduce costs and minimize environmental pollution.
Remote Monitoring and Control: The user-friendly dashboard and mobile app provide remote monitoring and control capabilities. This is particularly valuable for large farms where checking conditions in real time is challenging.

Scope

1. IoT Sensor Deployment:
Implement various sensors across the agricultural ecosystem to monitor different parameters such as soil conditions, weather, crop health, livestock data, and equipment status.
2. Connectivity and Data Collection:
Establish a robust and reliable network infrastructure to connect IoT sensors and devices across the farm or agricultural area. This includes selecting appropriate communication technologies (e.g., Wi-Fi, LoRaWAN, cellular) and data collection methods.
3. Data Analytics and Insights:
Develop a data analytics platform to process the data collected from IoT sensors. Implement machine learning algorithms to gain actionable insights into crop growth, disease prediction, livestock management, and resource optimization.
4. Automation and Control:
Implement automation systems that can control various processes and equipment based on real-time data and analysis results. This includes automated irrigation, fertilization, and pest control systems.
5. User Interface and Remote Monitoring:
Create a user-friendly interface, such as a web-based dashboard or mobile application, that allows farmers to remotely monitor the status of their crops, livestock, and equipment. Provide real-time alerts and the ability to control farm operations.
6. Sustainability Measures:
Implement and promote sustainable farming practices, such as precision agriculture, organic farming, and no-till farming, based on data-driven insight.

Learning Outcomes:

1. Successfully implemented this experiment
2. Learnt about Agriculture 4.0, and many sensors used in making of Smart agriculture.
3. . Understanding of IoT Technology: Gain a deep understanding of Internet of Things (IoT) technology, its components, and how it can be applied to the agriculture sector.
4. Precision Agriculture:
   Understand the concept of precision agriculture and how IoT technology can enable data-driven, precise farming practices.
5. 4. Resource Management: Learn how to optimize resource management, including water, fertilizers, and energy, based on data-driven insights.
6. Develop skills in automation and control systems, including how to set up automated irrigation, fertilization, and pest control based on real-time