Project : Smart Irrigation

Introduction :-

Agriculture :-
Agriculture is the practice of cultivating plants and rearing animals for the purpose of producing food, fiber, medicinal plants, and other products used by humans. It is an essential industry that plays a vital role in providing sustenance and resources for the world's population.

IoT also presents challenges, including data privacy and security concerns, interoperability issues, scalability, and managing the vast amounts of data generated. Addressing these challenges requires robust security measures, standardized protocols, and careful consideration of privacy regulations.

The challenges facing modern agriculture include ensuring food security for a growing global population, mitigating the effects of climate change, managing water resources efficiently, preserving biodiversity, and addressing socio-economic issues related to farming communities.

Irrigation in agriculture refers to the artificial application of water to crops or plants to provide sufficient moisture when natural rainfall is inadequate or irregular. It is a vital practice that plays a critical role in ensuring crop growth, productivity, and food security.

The field of agriculture continues to evolve, driven by research, innovation, and the need to address global challenges such as climate change, food security, and resource scarcity. It requires collaboration among farmers, scientists, policymakers, and stakeholders to develop sustainable farming practices, improve productivity, and ensure a secure and resilient food supply for future generations.

In summary, agriculture is a complex and dynamic field that encompasses the cultivation of plants and the rearing of animals to meet human needs. It is a critical industry that continues to evolve in response to technological advancements, environmental concerns, and societal demands.

IOT:-

The Internet of Things (IoT) refers to a network of interconnected physical devices, vehicles, buildings, and other objects embedded with sensors, software, and connectivity capabilities. These devices collect and exchange data, enabling them to interact and communicate with each other and with other systems through the internet.

IoT is a technology concept that allows objects and devices to be connected and remotely monitored or controlled. It goes beyond traditional computing devices like computers and smartphones, extending connectivity to a wide range of everyday objects. These objects can include household appliances, wearable devices, industrial machinery, vehicles, and even entire cities or infrastructure systems.

The primary goal of IoT is to enhance efficiency, improve decision-making, and enable new services and experiences. By connecting devices to the internet, they can transmit data in real time, enabling remote monitoring, control, and automation. This connectivity and data exchange enable a wide range of applications and benefits across various sectors and industries.

IoT has the potential to revolutionize various industries and sectors, including healthcare, transportation, agriculture, manufacturing, and smart cities. It offers benefits such as improved efficiency, automation, cost savings, and enhanced decision-making based on real-time data.

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Problem:-

Implementing IoT in agriculture can address several challenges related to irrigation. Some of the common irrigation problems in agriculture that IoT can help overcome include:

1. Inefficient Water Usage: Traditional irrigation methods often lead to inefficient water usage, resulting in water wastage and increased costs. IoT-based irrigation systems utilize sensors to collect real-time data on soil moisture, weather conditions, and crop water requirements. This data is then used to precisely regulate the amount and timing of water delivery, ensuring that plants receive the optimal amount of water while minimizing waste.
2. Over-Irrigation and Under-Irrigation: Inaccurate assessment of soil moisture levels can result in over-irrigation or under-irrigation, both of which can negatively impact crop health and yield. IoT sensors can provide accurate and continuous monitoring of soil moisture levels, allowing farmers to make informed decisions regarding irrigation schedules and avoid over-watering or drought stress.
3. Lack of Timely Action: Timeliness is crucial in irrigation management. Delayed detection of water stress or inadequate response to changing conditions can lead to crop damage. IoT-based systems can send real-time

alerts and notifications to farmers when soil moisture levels deviate from optimal thresholds. This enables farmers to take prompt action, adjusting irrigation settings or scheduling irrigation as needed.

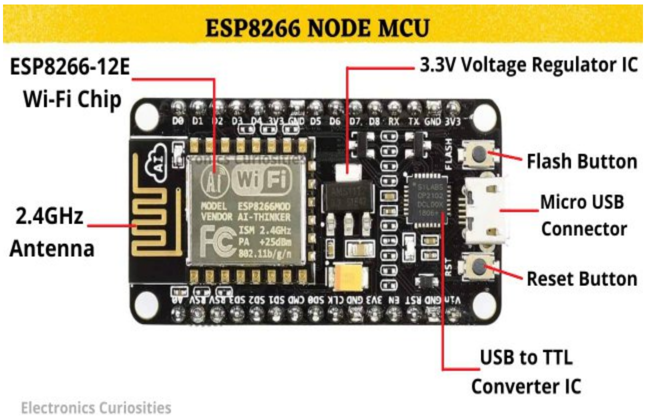
4. Limited Water Availability: In regions facing water scarcity, proper water management is vital. IoT-based systems can monitor water resources, including water levels in reservoirs, rivers, or wells. This information can help farmers make informed decisions regarding irrigation practices, considering the availability of water resources and optimizing water allocation among different fields or crops.

5. Remote Monitoring and Control: Traditional irrigation systems often require manual intervention and on-site monitoring. With IoT, farmers can remotely monitor and control irrigation systems through mobile applications or web interfaces. This allows for greater flexibility and efficiency, as farmers can manage irrigation operations from anywhere, saving time and resources.

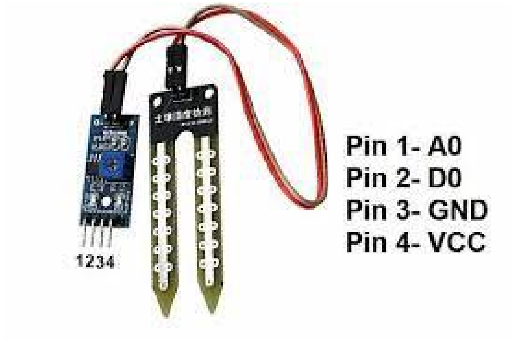
6. Data-Driven Decision-making: IoT-based irrigation systems generate a wealth of data on soil moisture, weather patterns, and crop water requirements. This data can be analyzed using advanced analytics and machine learning algorithms to gain insights and optimize irrigation practices. Farmers can make data-driven decisions on irrigation scheduling, water allocation, and resource management, leading to improved efficiency and productivity.

Requirements:-

1 Node MCU ESp8266 :



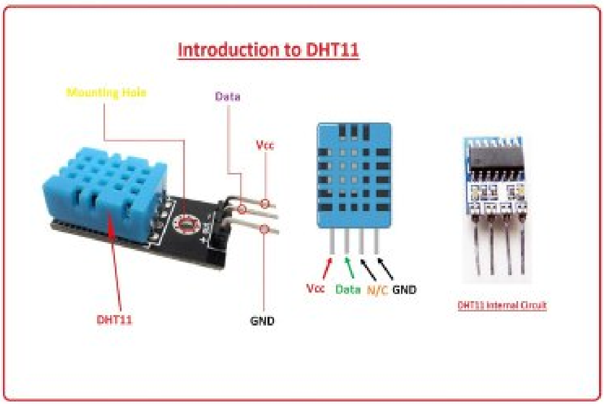
2 Soil Moisture Sensor :



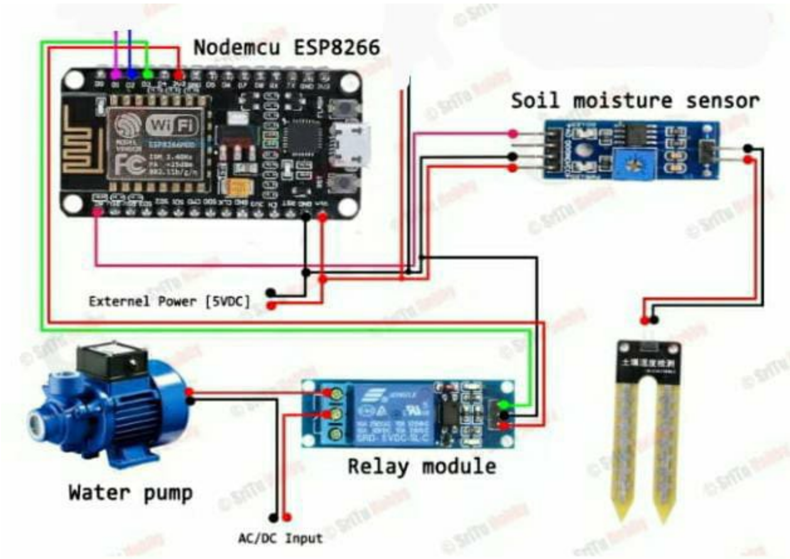
3 Relay Module :

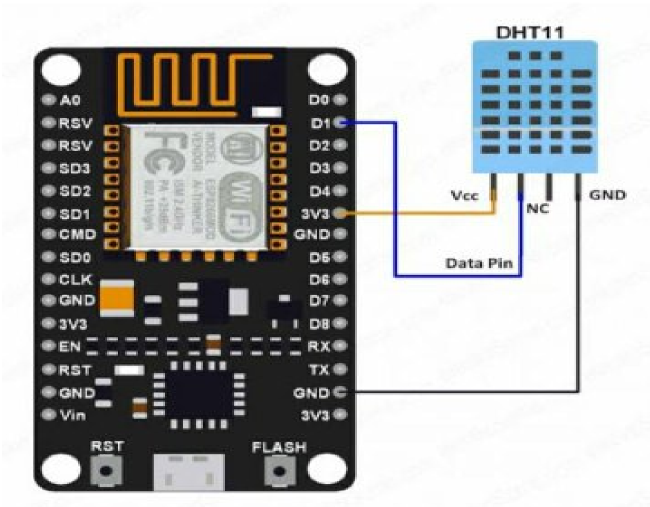
4 Water Pump :

5 DHT 11 :



Circuit Diagram : -





Work Overview :_

A smart irrigation IoT project typically involves the integration of various components, including sensors, connectivity, data processing, and automation. Here's an overview of how a smart irrigation IoT project works:

1. Sensor Deployment: Soil moisture sensors are placed in the field at different locations to monitor the moisture content in the soil. These sensors can be either directly inserted into the ground or placed at a specific depth.
2. Sensor Data Collection: The soil moisture sensors continuously measure the moisture levels in the soil and transmit the data to a central control system or a gateway device. The data can include information such as moisture levels, temperature, and other relevant environmental parameters.
3. Connectivity: The sensor data is transmitted wirelessly to the central control system or cloud platform using IoT connectivity technologies such as Wi-Fi, cellular networks, or LPWAN.
4. Data Processing and Analysis: The collected sensor data is processed and analyzed to derive meaningful insights. This can involve comparing the moisture levels with predefined thresholds or using algorithms to determine optimal irrigation schedules based on the specific crop's water requirements.
5. Decision-Making and Automation: Based on the analyzed data and predefined rules, the smart irrigation system makes decisions regarding when and how much water should be applied to the plants. This can involve activating irrigation valves, pumps, or sprinklers to provide water to the plants as needed.
6. Servo Motor : Servo Motor is used in Field for select the direction of water or quantity of water in the field . Servo Motors open when fields need water then the commands will be given to servo motor and after irrigation it will be closed automatically by the commands of the sensor .
7. Remote Monitoring and Control: The smart irrigation system can be accessed and monitored remotely through a mobile application or web interface. Users can view real-time sensor data, receive alerts for critical conditions (e.g., low soil moisture), and adjust irrigation settings if necessary.
8. Feedback Loop and Optimization: Over time, the system can collect historical data and use machine learning algorithms to optimize irrigation schedules and improve water usage efficiency. The system learns from past irrigation patterns, weather data, and crop responses to fine-tune the irrigation process.

By implementing a smart irrigation IoT project, the goal is to achieve efficient water usage, reduce water waste, and ensure optimal plant health. The automation and data-driven approach allow for precise irrigation control and monitoring, resulting in water conservation, cost savings, and improved agricultural or landscaping practices.

Code :-

```
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <Servo.h>
#include <DHT.h>
Servo servo;
Servo servo1;
char auth[] = "7XrQAtDy-H_Pey4BBafkE26YJfsFsb9t";
char ssid[] = "vivo 1811";
char pass[] = "244466666";
#define sensor A0
#define waterPump D3
#define DHTPIN 14 // DHT11 sensor pin D5
#define DHTTYPE DHT11 // DHT11 sensor type
DHT dht(DHTPIN, DHTTYPE);
BlynkTimer timer;
bool Relay = 0;
void setup()
{
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);
  servo.attach(15); // NodeMCU D8 pin
  servo1.attach(13); // NodeMCU D7 pin
```

```
  dht.begin();
  pinMode(waterPump, OUTPUT);
  digitalWrite(waterPump, HIGH);
  timer.setInterval(100L, soilMoistureSensor);
 }
void loop()
{
  Blynk.run();
  timer.run...
```

Result :


13:48
Smart Irrigate1
Temperature
36
-10
100
Humidity
38
0
100
Moisture
14
0
60
Motor
OFF
servo1
servo2


13:49
66
Smart Irrigate1
Temperature
36
-10
100
Humidity
38
0
100
Moisture
14
0
60
Motor
ON
servo1
servo2