AGRICULTURE AUTOMATION USING ARTIFICIAL SUNLIGHT

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Abstract

Modern agriculture faces the challenge of increasing demand for food production while dealing with limited arable land and the unpredictable effects of climate change. In response to these challenges, this final year project proposes a comprehensive solution by integrating automation technology with the use of artificial sunlight for crop cultivation. Agriculture Automation Using Artificial Sunlight aims to revolutionize traditional farming practices by implementing advanced technologies to enhance crop growth and yield. The project focuses on creating a controlled environment for crops through the use of artificial sunlight, eliminating dependency on natural sunlight. The system incorporates sensors, actuators, and a microcontroller-based control unit to monitor and adjust environmental parameters such as temperature, humidity, and light intensity. By simulating natural sunlight conditions, the system ensures optimal photosynthesis and growth conditions for crops throughout the year, leading to increased productivity and reduced dependency on weather patterns. The project also explores the integration of machine learning algorithms to optimize resource usage and predict crop behavior. Agriculture Automation Using Artificial Sunlight offers a sustainable and efficient approach to farming, contributing to food security and agricultural sustainability in the face of changing climate conditions.

I. INTRODUCTION

Internet of things (IOT) is one of the fastest growing technical areas.IoT is shared network of object and things which can interact each other provided with the internet connection .By using IoT we can increase in production in agricultue

Agriculture is one of most essential for humans life Agriculture is the backbone of the Indian economy. In India, around 70% of the population earns its livelihood from agriculture. The major problem faced in many agricultural areas is the lack of mechanization of farming activities. Manual data collection for desired factors can be sporadic, not continuous, and produce variations from incorrect measurements. Wireless distinct sensor nodes can reduce the time and effort required for monitoring the environment. We can reduce a lot of manual work in agriculture using automation.

The essential things of smart farming are environmental measurements and water management. The combination of traditional methods with the latest technology as the Internet of Things and Wireless Sensor Networks, can lead to agricultural modernization. The wireless Sensor Network collects the data from different sensors and sends it to the central server using a wireless protocol. Our smart farming system reduces manual work and automates agricultural activities

AGRICULTURAL AUTOMATION SYSTEM

Agriculture automation is an emerging concept because IoT sensors can provide information about the agriculture fields. These systems make use of evolving technology, i.e., IoT and smart agriculture, using automation. Monitoring environmental factors are the primary factor in improving the yield of efficient crops. The features of this paper include monitoring temperature and humidity in agricultural field through sensors using ESP8266 NodeMCU

The traditional method of agricultural monitoring includes the Sustainable food production is one of the major challenges of the twenty-first century in the era of global environmental problems such as climate change, increasing population, and natural resource degradation, including soil degradation and biodiversity loss. Climate change is among the greatest threats to agricultural systems.

Benefits of Agriculture Automation:

1. Improved product quality
2. Monitoring climate conditions
3. Crop monitoring
4. Drones Automation
5. This system reduce manual work
6. This technology also saves the excess use of water
7. protecting the crop from animals

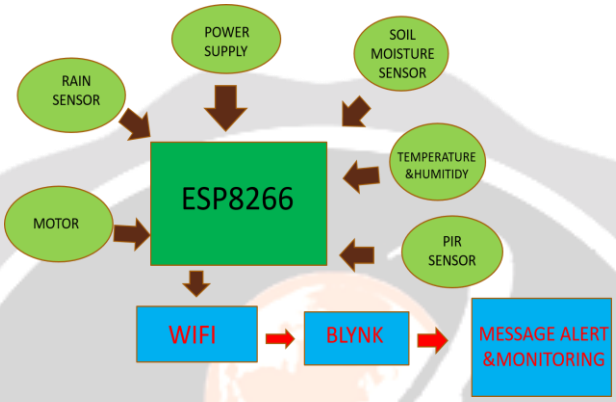

Figure :1 Block diagram of Agriculture Automation

This system's main idea is to automate farming activities by using the principle internet of things. There is one module: an ESP8266 node MCU. This system consists of a moisture sensor, thermal and humidity sensor, and a moisture sensor that measures water level and the estimated level of water on the ground.

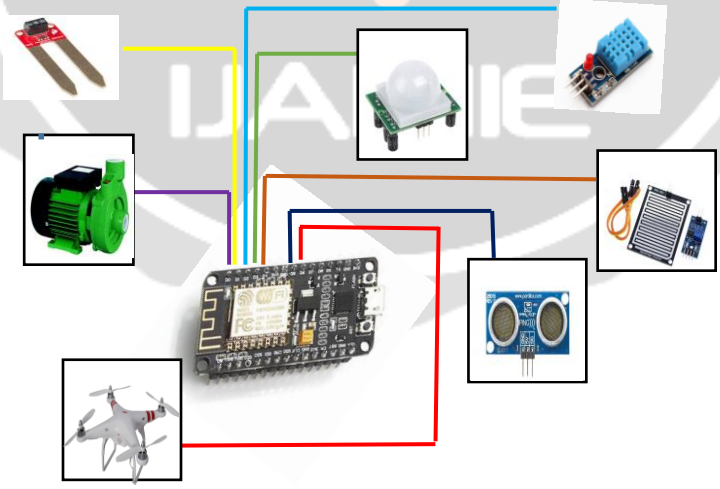

Figure :2 ESP82266 Board connection

The working of this proposed technique is illustrated as follows:

In the proposed system monitoring and controlling are done through sensors such as soil moisture sensor, PIR sensor, DHT sensor, ultrasonic sensor, and sensor, and drones are used for farmer application. Here, the data is transmitted through IoT. In this

system, the data is processed by ESP8266 node MCU. The Internet of Things is regarded as the third way of information technology after the Internet and mobile communication network, which is characterized more by sense and measure.

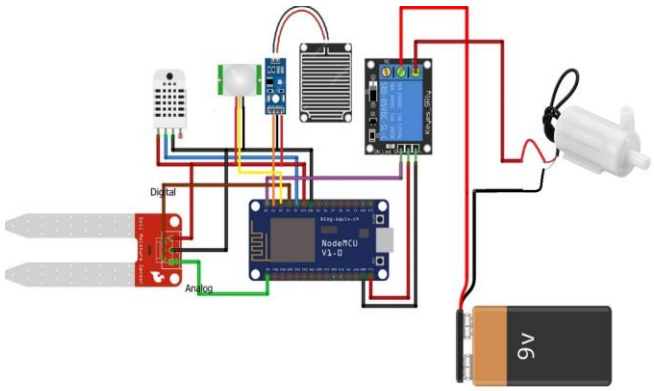

Figure :3 Agriculture Automation Circuit

The soil moisture sensor senses and measures the moisture level in the soil.
The PIR sensor detects the animals and a high frequency sound signal is provided.
The DHT sensor sense the current temperature sensor
The ultrasonic sensor senses and measure the water level in the tank.
These data are processed and the optimum water level will be supplied to the field by automatically switching on the power supply to the water pump.
The drones are activated through digital signal of ESP8266.
These data will be transmitted to the user's mobile phone through ESP8266 using a separate IP address for the given node MCUmodule, which is programmed to send the data given by the sensor to the user through a blynk app showing the live condition of the field.

ESP8266 Node MCU:

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module
NodeMCU Development Board Pinout Configuration
The NodeMCU ESP8266 development board comes with the ESP-12E module containing the ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth**.**

Specifications & Features

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1

- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug n Play

Board Pinout Configuration

Pin Category	Name	Description
Power	Micro-USB, 3.3V, GND, Vin	**Micro-USB:** NodeMCU can be powered through the USB port **3.3V:** Regulated 3.3V can be supplied to this pin to power the board **GND:** Ground pins **Vin:** External Power Supply
Control Pins	**EN, RST**	The pin and the button resets the microcontroller
Analog Pin	A0	Used to measure analog voltage in the range of 0-3.3V
GPIO Pins	GPIO1 to GPIO16	NodeMCU has 16 general purpose input-output pins on its board
SPI Pins	SD1, CMD, SD0, CLK	NodeMCU has four pins available for SPI communication.
UART Pins	TXD0, RXD0, TXD2, RXD2	NodeMCU has two UART interfaces, UART0 (RXD0 & TXD0) and UART1 (RXD1 & TXD1). UART1 is used to upload the firmware/program.

I2C Pins		NodeMCU has I2C functionality support but due to the internal functionality of these pins, you have to find which pin is I2C.

Programming NodeMCU ESP8266 with Arduino IDE

The NodeMCU Development Board can be easily programmed with Arduino IDE since it is easy to use. Programming NodeMCU with the Arduino IDE will hardly take 5-10 minutes. All you need is the Arduino IDE, a USB cable and the NodeMCU board itself.

NodeMCU ESP8266 Pinout

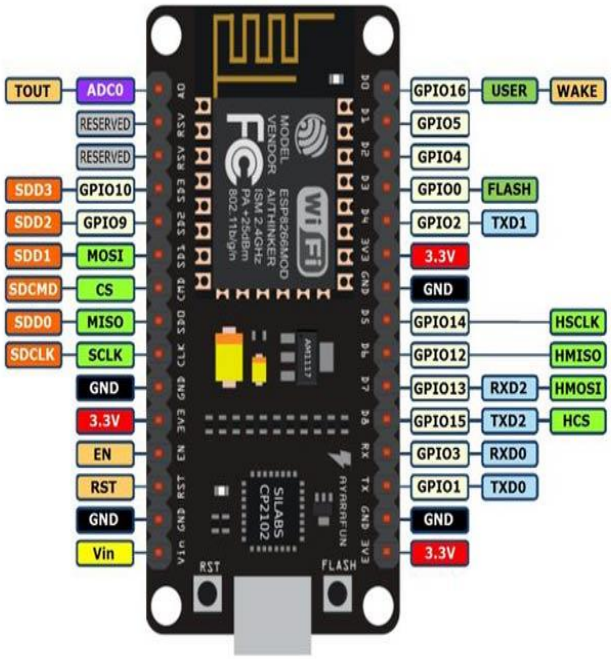

Figure:4 Pin diagram of ESP8266

Applications

- Prototyping of IoT devices
- Low power battery operated applications
- Network projects
- Projects requiring multiple I/O interfaces with Wi-Fi and Bluetooth functionalities

Moisture sensor:

Soil moisture plays a vital role in developing weather patterns and agricultural applications. A soil moisture sensor measures the quantity of water in a material, such as soil, on a volumetric basis. In this proposed research soil moisture sensor is used to know the exact soil moisture conditions in their fields. This helps farmers to use less water to grow a crop generally; they can increase yields and the quality of the produce by improved soil moisture management during critical plant growth stages.

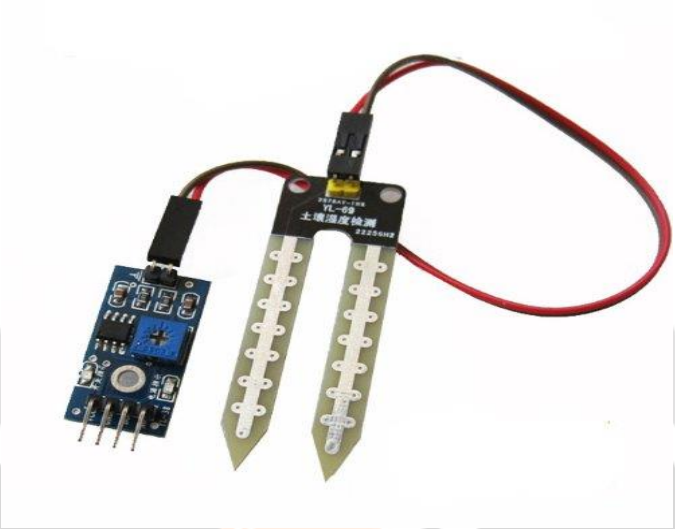

Figure: 5 Moisture sensor

UV LIGHT:

UV light, or ultraviolet light, is a type of electromagnetic radiation with wavelengths shorter than visible light. It is divided into three categories: UVA, UVB, and UVC. UV light plays a crucial role in various biological processes, including plant growth, DNA damage repair, and disinfection. While excessive exposure to UV radiation can be harmful to living organisms, controlled doses have beneficial effects, such as stimulating vitamin D synthesis in humans and enhancing plant defense mechanisms. In agriculture, UV light is increasingly being used to improve crop yield, quality, and resilience to pests and diseases.

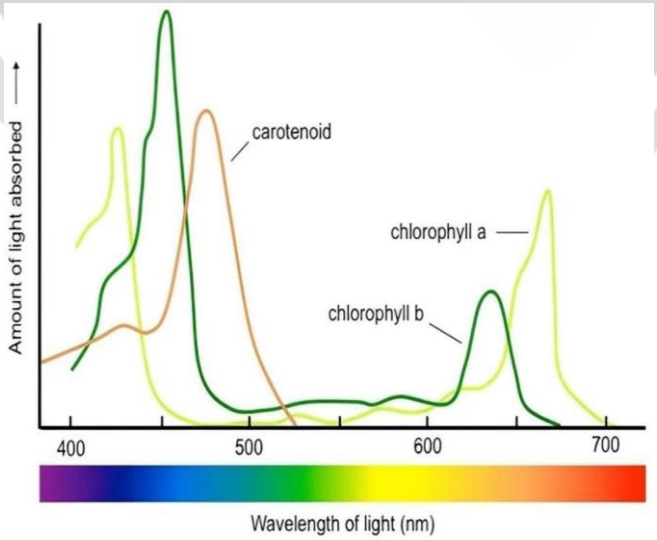

Figure: 5 Comparison:Natural Light and Artificial light

DHT sensor:

The DHT11 is a commonly used Temperature and humidity sensor for prototypes monitoring a given area's ambient temperature and humidity. The sensor can measure temperature from 0°C to 50°C with an accuracy of ±2°C and humidity from 20% to 90% with an accuracy of ±5% RH.
It used to know the current weather temperature. It is also used to know the humidity**.**

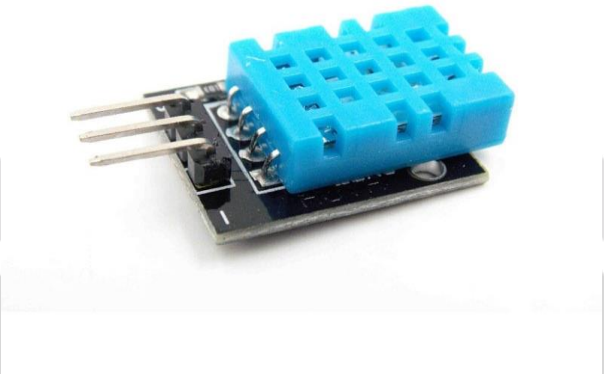

Figure : 6 DHT sensor

Water pump:
A water pump **is** an electromechanical machine used to increase the pressure of water to move it from one point to another**.** When the water hits the rotating impeller, energy of the impeller is transferred to the water, forcing the water out.

Figure : 7 Water pump

Blynk
Blynk is an IoT platform for iOS or Android smartphones that control Arduino, Raspberry Pi, and NodeMCU via the Interne**t**. This application is used to create a graphical interface or human-machine interface (HMI) by compiling and providing the appropriate address on the available widgets

Output:

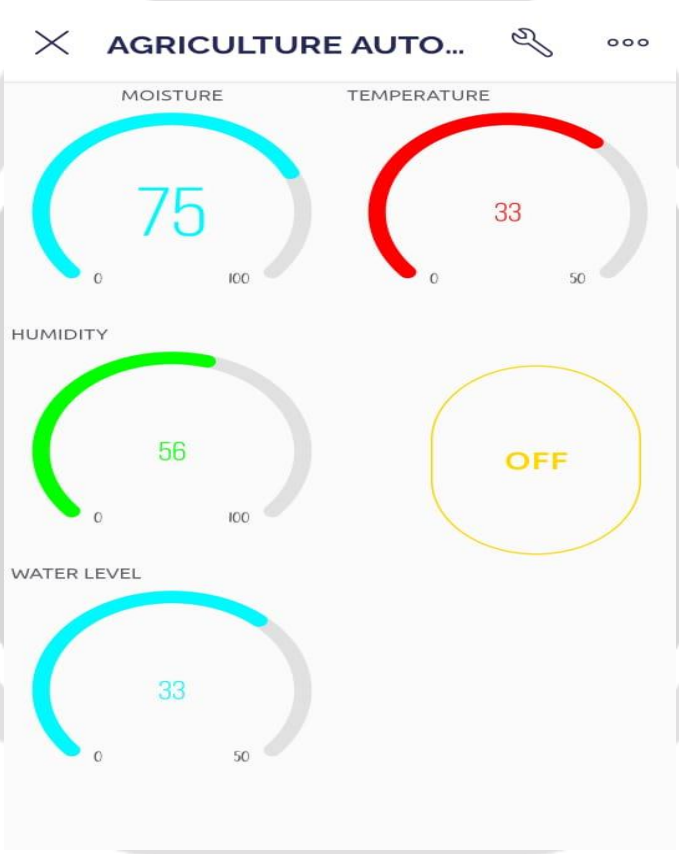

Figure : 8 BLYNK Users interface

Conclusion:

The development of the agriculture sector will always be a priority especially given the dynamics of the world today. Therefore, using IoT in agriculture has a promising future as a driving force of efficiency, sustainability, and scalability in this industry**.**

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