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Review on Green House Automation using IOT

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Abstract: **Internet of Things (IoT) technology is expected to play a basic portion in moving forward agrarian capacity to meet food request. Smart agriculture incorporates IoT based modern technologies to improve operational efficiency, maximize yield, and reduce wastage through deployment of control mechanism. The major aim behind this project is to design and build an automated greenhouse for Federal College of agriculture, Akure using Internet of things (IOT) devices that can maintain the natural conditions, by acting upon live sensor readings. Raspberry Pi will be used as a controller to receives input from a different sensors and it control motor, light and other actuators.**

Keywords: **Internet of Things (IoT), real-time, Raspberry Pi, Smart agriculture.**

1. INTRODUCTION

Federal College of Agriculture Akure, founded in 1957 is one of the leading institutions in Nigeria that trains middle-level manpower in the area of agriculture. The Institutions mission is to help the nation reduce its unemployment rate, increase food security, and equip its students with the skills required to be self-reliant through agriculture. The College is a research institution made up of four sub-sectors: Crop Production, Livestock, Forestry and Fishing.

Crop production is the branch of agriculture that deals with the production of crops for food and fiber (byjus 2022). The institution grows different varieties of plants. Some of these crops cannot grow well if the climatic condition is not control because of there fragile nature while some do not need human intervention or any special climate or temperature to grow. Different climatic conditions are needed for a different type of crops, it implies that certain crops can only crow in a particular season. To address the difficulty of producing crops only during a specific season, an environment can be established where high-value crops that require a lot of attention can be produced in an automated green house with little human participation. The temperature and other climatic conditions inside the greenhouse may be maintained by themselves because the green house is automated, hence manpower is not necessary.

A greenhouse is a structure or a building with transparent walls and roofing material, such as Polyethylene plastic, in which plants that require climate control are grown (Smitha et al., 2016). Inside the greenhouse, unusual environmental conditions such as high temperatures and excessive humidity might harm the plants. As a result, environmental regulation is required. The primary goal of this project is to develop and construct an automated greenhouse using an Internet of Things (IOT) controller that can maintain environmental parameters by acting on real-time sensor inputs. The Raspberry Pi will operate as a controller, receiving data from a variety of sensors and controlling motors, lights, and other actuators.

IoT refers to the interconnection of physical items that are equipped with electrical circuits, sensors, software, and a network connection that allows them to share data.

The project's specific goals are to propose a greenhouse automation system based on the Internet of Things (IOT). The device will be able to regulate the soil's humidity, temperature, and moisture.

2. LITERATURE REVIEW

Prototype of an automated greenhouse was implemented in the work of Shankaraiah et al., (2019), in which the control the parameters like humidity, temperature, and soil moisture, using sensors like DTH 11, LM 35, and also take pictures of the plant at specific times and send them to mail, so that if a person wants to ascertain the status of the plant to know if it is infected or healthy. The project also uses feedback control, which means it monitors the green house by calibrating precise results and adjusts the settings as needed.

Shelvane et al. (2019) developed a Raspberry-pi-based real-time remote control greenhouse monitoring system that allows users to track environmental parameters remotely. The project's major goal is to create a simple, low-cost system that continuously updates and controls the value of environmental parameters in order to ensure optimal plant growth. The key sensors utilized in the research are the DHT11, soil moisture sensor, and LDR sensor, which provide precise values for temperature, humidity, soil water content, and light intensity. The Raspberry-pi motherboard is connected to all of the resources, including the cooling fan, artificial light, and motor pump. The project was split into two sections, with the first involving programming the Raspberry Pi with the Python programming language.

In their paper IoT based Smart Farm, Gondchawar et al. (2016) attempt to construct a smart and automated agriculture utilizing internet of things technology. The technology was created using a GPS-based remote controlled robot. Spraying, weeding, moisture sensing, bird and animal scaring, security, and other tasks are among the system's responsibilities. Smart irrigation with smart control and intelligent decision making based on reliable real-time field data are also part of the project. Finally, the warehouse was designed to contain the following features: temperature control, humidity control, and theft detection. Controlling of all these activities was done by remote smart device or computer connected to Internet and the operations was achieved by interfacing sensors, Wi-Fi, camera and actuators with micro-controller and raspberry pi.

3. DIAGRAM-1: BLOCK DIAGRAM OF THE PROPOSED WORK

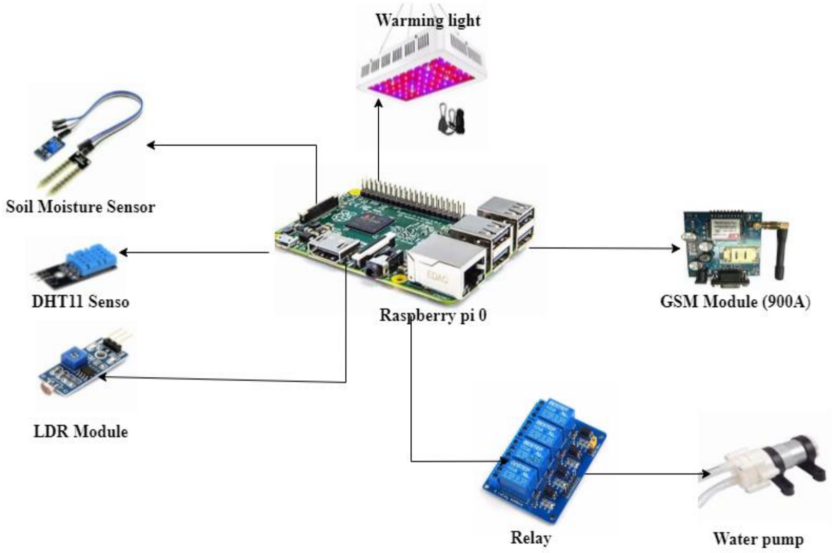

Figure 1: Block Diagram

4. HARDWARE COMPONENTS

4.1 Raspberry-Pi 0 version 1.3

The Raspberry Pi is a low-cost, compact computer that connects to a computer monitor or television and operates with a regular keyboard and mouse. It is a small board that allows users to experiment with computing and learn to program in languages such as Scratch and Python. The Raspberry Pi has been updated to include a camera connection for the Pi Zero, which can only be used with a Raspberry Pi Zero Camera Cable. Only a regular Raspberry Pi Camera cable is compatible with this board.

- A Broadcom BCM2835 application processor
- 1GHz ARM11 core which is40% faster than Raspberry Pi 1
- 512MB of LPDDR2 SDRAM
- A micro-SD card slot •
- Micro-USB sockets for data and power

- An unpopulated 40-pin GPIO header
- Identical pin out to Model A+/B+/2
- An unpopulated composite video header

Figure 2: Raspberry pi 0

4.2 Soil Ph Sensor

Soil pH refers to the current pH of the soil, which plays a vital role in plant growth. Every plant has its own pH that is best for its growth, however it can thrive in a wide range. Controlling the pH of the soil is therefore critical for crop growth.

A device that measures the current pH of the soil is known as a soil pH sensor. Two stainless steel probes of the sensor are put vertically into the soil to determine the pH value. The pH of soil can be classified as acidic, alkaline, or neutral. The pH of the soil is also an essential component in determining soil fertility. Apart from sweet potatoes and blueberries, soil pH determines the abundance of microorganisms and nutritional availability.

Figure 3: Soil Ph Sensor

4.3 Soil Moisture Senso

The Soil Dampness Senso is a device for determining the volumetric water content of soil and other plasmatic materials. The two exposed pads form the sensor's test. As the amount of water in the soil accumulates, superior conductivity between the pads is observed. To investigate the sensor's usable yield, this pad is attached to a module, which is then connected to an ADC (MCP3208 12bit 8channel) chip.

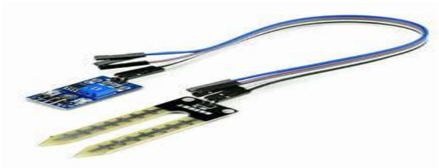

Figure 4: Soil Moisture Sensor

4.4 DHT11 Senso

The DHT11 Senso relatively inexpensive sensor that measures soil temperature and humidity. The air is measured using a capacitive humidity sensor and thermistors. The Raspberry Pi receives the digital signal.

Figure 5: DHT11 Senso

4.5 DS18B20 Sensor

The DS18B20 is a temperature sensor that provides 9-bit to 12-bit temperature data. These numbers represent the temperature of a certain device. This sensor can connect with an internal chip using a one-wire transport convention, which employs one information line. Furthermore, this sensor obtains the control supply directly from the information line, eliminating the requirement for an external control supply. Mechanical frameworks, consumer goods, thermally sensitive frameworks, thermostatic controls, and thermometers are among the uses for the DS18B20 temperature sensor.

Figure 6: DHT11 Senso

4.6 GSM Module (900A)

A GSM/GPRS Module is an IC or chip that uses a Subscriber Identity Module and Radio Waves to connect to GSM communication. 850MHz, 900MHz, 1800MHz, and 1900MHz are the most popular radio frequencies used by GSM Modules. For the interface and to send SMS to the farmer as designed, we link it to the Raspberry Pi.

Figure 7: GSM Module (900A)

4.7 LDR Module

intensity of light can be determined using LDR sensor module. it is digital sensor as well as analog sensor module that can also be refer to as Photoresistor sensor. This sensor has an onboard Light Dependent Resistor, that helps it to detect light. The yield of the module goes high in the absence of light and it gets to be low in the presence of light. The affectability of the sensor can be balanced utilizing the onboard potentiometer.

Figure 8: LDR Module

4.8 Water pump

The water pump can be characterized as a pump which employments the principles like mechanical as well as pressure driven all through a channel system and to create adequate drive for its future use. When the soil becomes dry, a water pump is linked to the Raspberry Pi through a relay to give it with the water it demands.

Figure 9: Water pump

4.9 Warming light

This light may be turned on automatically by the system to help the crop develop quicker and more effectively. The system is completely automated, but the agriculturist can manage it physically via the app.

Figure 10: Warming light

5. CONCLUSIONS

A greenhouse is a structure with high technology equipment or facilities that can control the temperature of the environment. It is good for lants that require specific climatic condition to grow healthy. The specific objectives of this project are to proposed a greenhouse automation using Internet of Things (IOT). The system will be able to control the humidity, temperature and moisture of the soil.

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