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DEVELOPING A SMART MODEL BASED ON INTERNET OF THINGS (IOT) FOR AN ENHANCED CROP MONITORING SYSTEM TO OBTAIN OPTIMUM YIELDS

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ABSTRACT

India's main economic spine is agriculture. Multiple factors influence the crop's yield. The most important factors are soil moisture, weather conditions, field maintenance, and fencing. An animal is likely to attack the field if the fencing is installed correctly. We use a PIR sensor to detect movements to avoid the above scenario. As a result, when a movement is detected, a buzzer will sound.

There are very few situations in which the crop completely ripens under fire. To avoid this dangerous situation, we have implemented a flame sensor and a GSM module to alert the appropriate person whenever the crop comes into contact with fire. Additionally, we monitor the soil moisture level, determining when the motor turns on and off.

INTRODUCTION

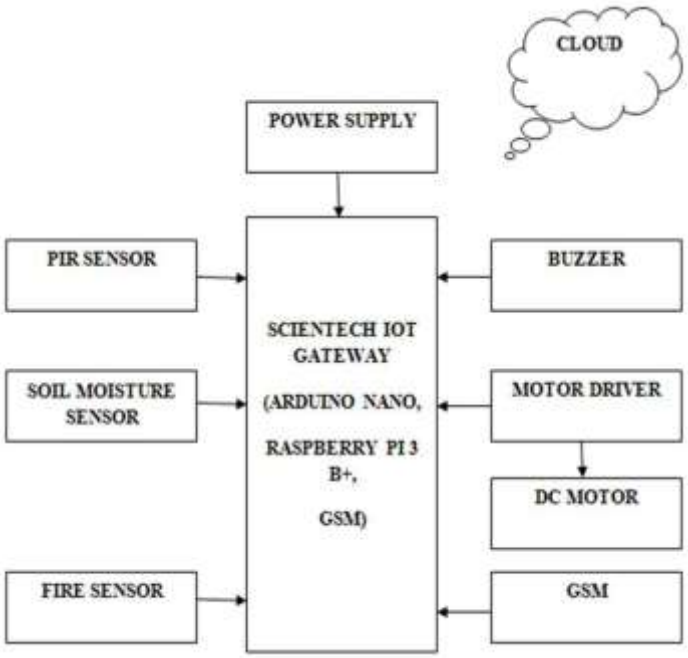
An Overview

Traditional farming practices still exist in India. Most agricultural and farming activities are based on predictions that do not produce the expected results. The farmers will have to bear even more losses and occasionally commit suicide. Numerous factors, like soil moisture and fencing, must be monitored and addressed to boost crop growth.

We came up with the concept of an IOT-based crop monitoring system to prevent losses in the agricultural sector. This system makes it simple to keep an eye on the crop, is affordable for every farmer, and avoids dangerous situations because it's possible to get shocked while operating the motor. In general, we try to prevent death, injury, and the risk of losing the crop.

PROPOSED METHOD

In the proposed method, an IOT-based crop monitoring system uses sensors to collect all agricultural field data. Our proposed work uses three sensors: PIR, a flame sensor, and soil moisture. The IOT gateway is connected to the three sensors. Additionally, an IOT server stores the data in the cloud. Most of this project relies on serial communication between raspberry pi and an Arduino nano. The IOT-based crop monitoring system is depicted in the diagram below.



A. IOT Gateway

Scientech is an industrial sensor gateway with a powerful Linux/Windows embedded operating system. It also supports wireless Zigbee, Bluetooth Low Energy (BLE), 6LoWPAN, and IEEE 802.15.4 MAC to communicate with sensors networks and other end-to-end reliable communication channels, Wi-Fi, Ethernet, and GSM to connect to the cloud. Additionally, Scientech can be used as a stand-alone private cloud server by running MQTT Broker, and a local Database with limited features and rich The IOT Gateway contains the Arduino nano, Raspberry Pi 3B+, and GSM. It doesn't need a regulator circuit because it runs on 230V AC directly. There are several ways to communicate with the gateway, including Bluetooth, Wi-Fi, GSM, and Ethernet. Ethernet, USB, HDMI output, and sensors are all available via the gateway's external connectors. The gateway has five connectors for sensors, each of which is referred to alphabetically: A, B, C, D, and E; 8 analogue and 7 digital inputs.

Sensor connections can be made using the input and output pins. The table also shows the connection between the pins.

Port connection	Arduino pin
A1	+5V
A2	A1
A3	D2
A4	A0
A5	Gnd
B1	+5V
B2	A3
B3	D3
B4	A2
B5	Gnd
C1	+5V

B. PIR Sensor

An electronic sensor known as a passive infrared sensor (PIR) measures infrared light emitted by objects within its field of view. It detects movement. The crop's PIR sensor is used to track the movement of animals. The buzzer sounds when an animal is detected without harming the animal. The buzzer sound should be between 15 and 22 kHz in frequency. The detection angle of a PIR sensor ought to be 120 degrees, and its detection range should be around 20 feet (6 meters).

Frequency range of hearing for humans and selected animals		
animal	frequency (hertz)	
	low	high
humans	20	20,000
cats	100	32,000
dogs	40	46,000
horses	31	40,000
elephants	16	12,000
cattle	16	40,000
bats	1,000	150,000
grasshoppers and locusts	100	50,000
rodents	1,000	100,000
whales and dolphins	70	150,000
seals and sea lions	200	55,000

In the current scenario, the soil moisture sensor is one of the crucial parameters utilized in automatic irrigation systems. Typically, the soil moisture sensors are buried beneath the crops. The sensor is used to determine the soil's moisture content. The module output is high (the motor is on) when the soil has a low moisture content; otherwise, the output is low (the motor is off).

C. Flame Sensor

It detects heat. When temperature is high, the device turns on and produces the right output. Depending on the GSM module, the output could be a buzzer sound or a message signal to the farmer.

The flame sensor is used to locate the wavelength between 760 and 1100 nanometers, and the detection angle ought to be 60 degrees.

FLOW DIAGRAM

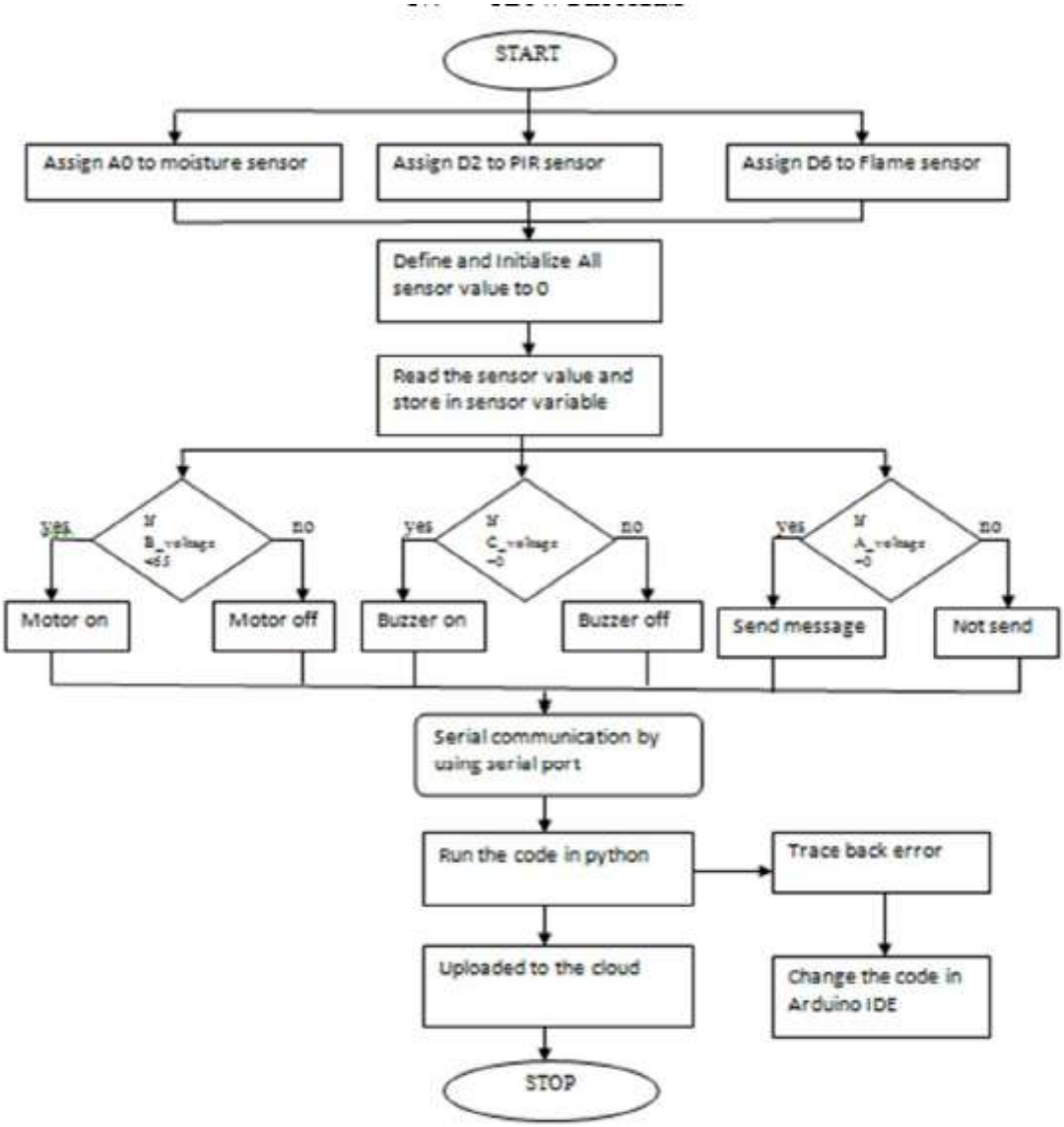


Fig. Flow Diagram

1) STAGE1 Assign analog pin A2 to soil moisture sensor. Assign digital pin D4 to PIR and Assign digital pin D2 to flame sensor.

2) STAGE 2 defines and initialize all sensor value to 0 i.e., int Sensor Value=0

3) STAGE 3 Read SensorPin and store value in Sensor value variable

4) STAGE 4 if sensor value is greater than 65, the motor is off. If the sensor value is less than 65, the motor is on

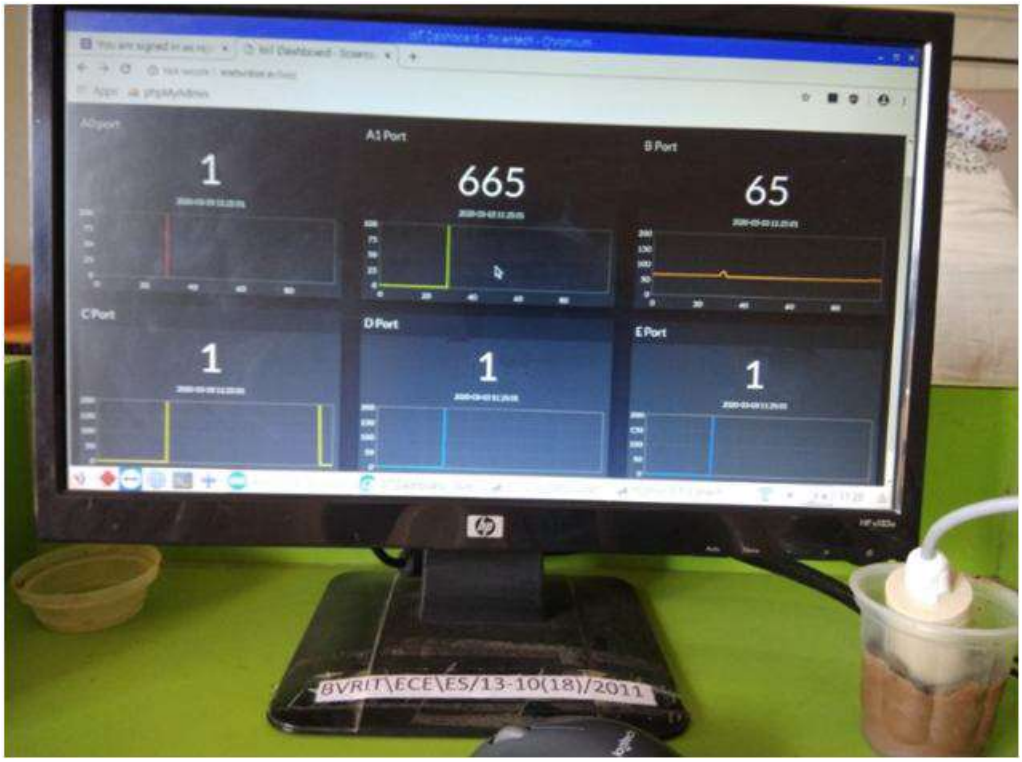
5) STAGE5 if the sensor value is high, buzzer will be on. If the sensor value is less, buzzer will be off.

6) STAGE6 if the sensor value is high, the message will be sent to the user by using GSM module. If the sensor value is less, the message will not send to the user.

7) STAGE7 serial communicate between arduino nano and raspberry pi by using serial port

8) STAGE8 if any trace back error is occurred in the python shell again go to the arduino code and change the program and the process is continuous. If there is no trace back error in the python shell, the data is stored in the cloud.

RESULT



CONCLUSION

Measuring soil moisture, PIR, and fire are the three parameters. The primary goal of developing this IOT-based crop monitoring system was to make it more innovative, user-friendly, and economical than the current systems. Farmers will benefit from this project by safeguarding their yield. Farmers and gardeners who require more time to harvest are the primary beneficiaries of this project.

Because they need to learn about the current situation, farmers face significant challenges in their agricultural fields.

The PIR sensor keeps animals and birds out of the field. A PIR sensor detects the animals and emits a sound to prevent wild animals from entering the farm. It will escape. The moisture content of the crop or plant is detected using a moisture sensor.

It uses the motor to produce water if the moisture level is below the threshold. The Pir sensor detects the fire. The GSM module informs the farmer about the state of the field when it detects a fire. The farmers can keep an eye on the state of the fields from any location. The IOT builder aids in sampling soil, PIR, and fire in real time. As a result, the collected data can further be utilized for crop analysis. We have also taken numerous soil, PIR, and fire readings on various days. Agriculturists can also benefit from cloud-based data.

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