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Smart Soil Moisture Checking and Watering System

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Abstract
Soil moisture is a measure of the moisture of soil which defines the soil health. Healthier the soil, healthier the plant. The main issue defined in the agriculture is the lack of water due to poor irrigation and droughts that results drying of the fields. To check the soil moisture, we use moisture sensors that accurately give the percentage of the moisture that contain in the soil and gives the required percentage of soil moisture for that particular soil. The dry moisture values usually range in 25 percent to 30 percent. The sensor activates whenever it detects the dry moisture values and alerts the system to start watering the soil. Soil moisture sensor is one of the interfaces. Another interface discussed in this review is watering sensor. Water is another important factor required for a smooth plant growth. The water required for the irrigation is stored in a tank. The water in the water tank is collected in two ways. One way is to collecting water through rain harvesting and another way of collecting water is through humidifying the vapor in the air. There are no devices used in the first way of collecting water. But in the second way of collecting water, it uses watering sensors that are used to convert the humidity of the air to water. This review is aimed for the amalgamation of these two interfaces into one.

Introduction

Water Scarcity is one of the major problems in the agriculture. During hot summer days,It is really much hard for them to take care of their crops. Watering of crops should be done in the proper manner to make harvest a crop. Hence Irrigation plays a major role in the crop harvesting. Irrigation helps to grow plants, maintain landscapes, etc. Through IOT (Internet of Things) we can achieve the concept called "Smart Farming". In today's world everyone one of us are using Smart Devices to make our works easier and quicker. Through this technology we can achieve the smart farming.

In recent times, the organic farming has been growing day by day. So, to ensure the quality of crop, we should take care of few parameters like moisture, Type of soil being used, fertility of soil etc. Based on these factors, the health of the crop can be determined. The design of the proposed system has been designed in such a way to monitor the moisture in the soil and watering the crop based on the measured moisture value.

IOT Based Soil Moisture Checking and WateringSystem

IOT is a network of interconnected things and people through which the communication takes place. In IOT enabled systems we can embed the real time behaviour which really makes this technology more useful. Most of the IOT enabled systems works in real time environment.

The proposed system works in a way that it consists of two systems with the interface. One system is about checking the moisture present in the soil and the other is system is about collecting the water from the droplets present in the humid air. As we know, in summer days the air will be humid, which means it has a lot of water. Through a process called "Condensation" the humid in the air will be converted into water. The proposed system collets the water present in the air through this process and collects this water into a container whenever the soil gets dried the water in the container can be used to water this dried soil. The water in the container can be collected in two ways one is through

the direct rain water and another is through our Atmospheric Water Generator system.

Literature Survey

Dr. Ayyasamy S, Eswaran S, Manikandan B, Mithun Solomon S P, Nirmal Kumar S proposed a system that mainly focuses on analysing the number of micro-nutrients that are present in the farmland and discusses about how to maintain the safe bounds of moisture levels that are required for the crop. This defines to remove the excess level of water from the farmland that mostly occurs due to excessive rainfalls and flood. Different types of sensors: soil moisture sensor, water level sensor, pH sensor and DHT-11 sensor are used. A suction motor is used for the removal of excess water in the farmland. The data collected through these sensors are sent to Cloud Storage Brokage (CSB). The Cloud Storage Brokage collects the data through these sensors, analyses the data and decides to turn ON/OFF the suction motors.This system also provides weather prediction using a prediction algorithm that uses records of the sensor readings. The final outcome is monitoring the soil moisture and the measurement of number of micro-nutrients. Dataset is considered by taking different water requirements for different crops. This is done by taking the water level and the latest reading by the sensor into consideration.

These values are graphed and based on these values the necessary fertilizers and the required water content is maintained.

Supachai Puengsungwan proposed a system that mainly focuses on watering of plants based on the soil moisture. In his proposed system, the sensor would read the moisture value present in the soil and calculates the duration and then the system would starts watering the soil. Brief discussion of IOT technology in the smart farming has been mentioned in this base paper.

Wei He 1, Pengkun Yu 1, Zhongting Hu 1, Song Lv 2, Minghui Qin 3 and Cairui Yu 1 did the experiment and performance analysis on the Atmospheric water Generator. Brief description about the generation of water has been mentioned. Here two thermoelectric coolers has been used. Model A is designed for extracting water from atmospheric vapor and then experimentally studied under a small inlet air flow rate. Model B is a reference model to compare the two models. Through the comparisons, at an air humidity of 90% and air flow rate of 30 m3/h, the total water yield was increased by 43.4% and the corresponding value reached the maximum increment of 66.7% at an air humidity of 60% and air flow rate of 30 m3/h. Through these features, the impact of relative humidity has been taken place.

Methodology

The Proposed system is made up of the two systems integrated with the interface. The system contains few hardware components and software such as Arduino IDE, Flutter etc. The soil moisture sensor checks the moisture present in the soil and the atmospheric water generator system generates the water present in the air.

Through flutter we are creating the interface to choose the type of soil that is being used and the crop that going to be harvest. Based on these two factors the value of the moisture would be set. The moisture or the level of watering of a crop depends upon the crop and the type of soil.

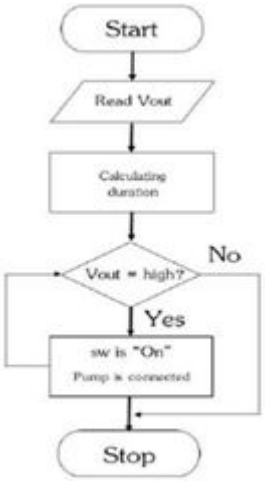

Fig 1: Existing System

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The interface provides the user to select the crop and soil based on these values the moisture value will be set in the moisture sensor system.

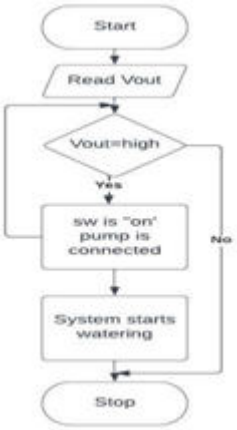

Fig 2: Proposed System

Components

This project consists of two systems that are combined together to form a single interface. The first system is the soil moisture sensor that is used to determine the percentage of the moisture in a particular crop. This soil moisture sensor is placed in a certain area of the ground. The working of this sensor can be done by inserting this sensor into the earth and the status of the water content in the soil can be reported in the form of a percent.

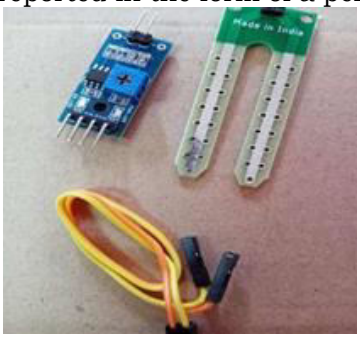

Fig 3: Soil Moisture Sensor

The soil moisture sensor consists of VCC pin, A0 pin, D0 pin and GND pin. Each pin of the four pins is used for a specific purpose. The VCC pin is used for power. Minimum power is required for sending or receiving the data. The A0 pin and the D0 pin are used for analog output and digital output respectively. The GND pin is used for the ground. This pin is the one that senses the moisture of the soil and return the values either in analog or digital. Other than the pins, the soil moisture sensor also comprises of potentiometer and LED.

The potentiometer is used to fix the threshold value. Later, this threshold value is used in such a way that the sensor checks if the moisture is in the threshold value or not. If the moisture percent is below the fixed threshold value, then the moisture sensor sends signals to water the crop. The LED will turn on/off based on the threshold value.

The Arduino Uno is a microcontroller board based on the ATmega328P. It can be integrated in many electronic projects. It is universally known as 'Stock Arduino". It consists of 14 digital input/output pins.

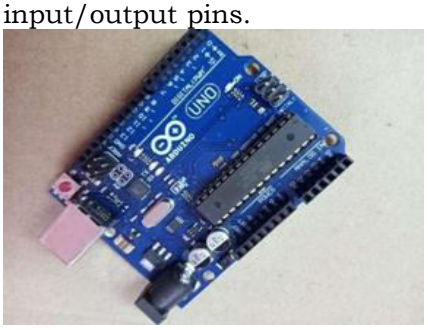

Fig 4: Arduino Uno Board

Arduino programs are written in the Arduino Integrated Development Environment (IDE).Arduino IDE is used to write the programs for the different Arduino boards.

ARDUINO

Fig 5: Arduino IDE

Flutter is an open-source framework developed by Google to develop cross-platform applications from a single codebase.

Flutter

Fig 6: Flutter Software

Another system that is discussed in this project is humidifying the vapor in air to water.

The other necessary components that are required for the device are thermal paste, 5 Volt power supply, connecting wires and jumper wires. Thermal paste is used as adhesive for strong connection of wires when connected. Peltier module is a thermoelectric module which has both cooling and heating effects. By passing the current through it, the surface temperature would be changed. 5 Volt power supply is required to run the Peltier module. It contains two external ceramic plates separated by semiconductor pellets.

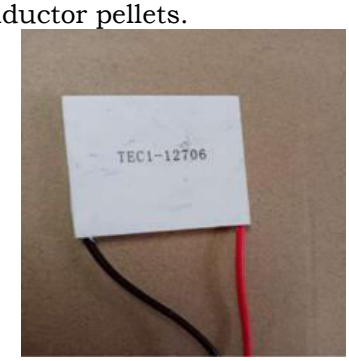

Fig 6: Peltier Module

And the jumper wires are used for the connections between the breadboard and the Arduino's pins. There are three types of jumper wires: male-to-male jumper, male- to-female jumper and female-to-female jumper.

Aluminium Heat Exchanger is a piece of equipment built for efficient heat transfer from one medium to another. Aluminium is an excellent conductor of heat.

12- volt DC Exhaust fan is used here, that will blow away heat from the motors and also keep the motor run well. This mini fan has the ability to run at a speed of 6800 rpm. The body of the fan is built from a combination of resin and plastic material. This provides strength and insulation to the fan.


Fig 7: 12 Volt DC exhaust fan

Conclusion

This paper includes the brief explanation about the Smart soil Moisture Checking and Watering system. It briefly gives the description about the Soil Moisture checking and watering system. It also contains the brief description about the components involved. This paper is purely describing about the working nature of the IOT based moisture checking and watering system for the irrigation. It is portable to use. It is very useful and affordable to the farmers.

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