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A SMART & AUTONOMOUS WIRELESS MONITORING SYSTEM FOR METICULOUSNESS AGRICULTURE USING IOT

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ABSTRACT

In present scenario, there is no mechanism to find where irrigation is needed. In this Project, we made Wi-Fi wireless sensor network for monitoring the humidity level by Deploying moisture sensors in the land to detect the places where the water content is low and some more environmental monitoring parameters. From the above methodology we can conserve water and minimize the problem of water spring in the land. We used humidity Sensor to sense the weather. By this, farmers can get idea about the climate. If there is any chance for rainfall; the farmer need not irrigate the crop field. Due to this we can Conserve water and also power since we didn't turn on motors. Nowadays in the crops the Fertilizer level is increasing, which affects people. By using pH sensors, we get the Information about the soil and analyze the acid level of the soil. By which we can apply fertilizer to the place where it needs, also we can avoid over fertilization of the crops. Temperature is a Randomly varying quantity in the environment of paddy field. Temperature reading gives Information to the farmer. By using temperature sensors, we can detect the temperature, and Irrigate the water to the crop.

This project reports the design and development of a smart wireless sensor network (WSN) by IOT for an agricultural environment. Monitoring agricultural environments for various factors such as temperature, humidity, water level & fertilizer level along with other factors can be of significance. The ability to document and detail changes in parameters of interest has become increasingly valuable. Investigations were performed for a remote monitoring system using RF. These nodes send data wirelessly to a central server, which collects the data, stores it and allows it to be analyzed and displayed as needed.

Introduction

The application of fertilizers and pesticides in agricultural areas is of prime importance for crop yields. The use of aircrafts is becoming common in carrying out the task because of the speed, accuracy and effectiveness in spraying operation. The farmers are using the spraying bags to spray pesticides all over the farm. The farmers have to carry the pesticide spraying bag which makes them get strained. Even then the farmers are unable to evenly distribute the pesticides all over the farm. And also it will be time consuming. The farmer can spray the pesticides using drone evenly

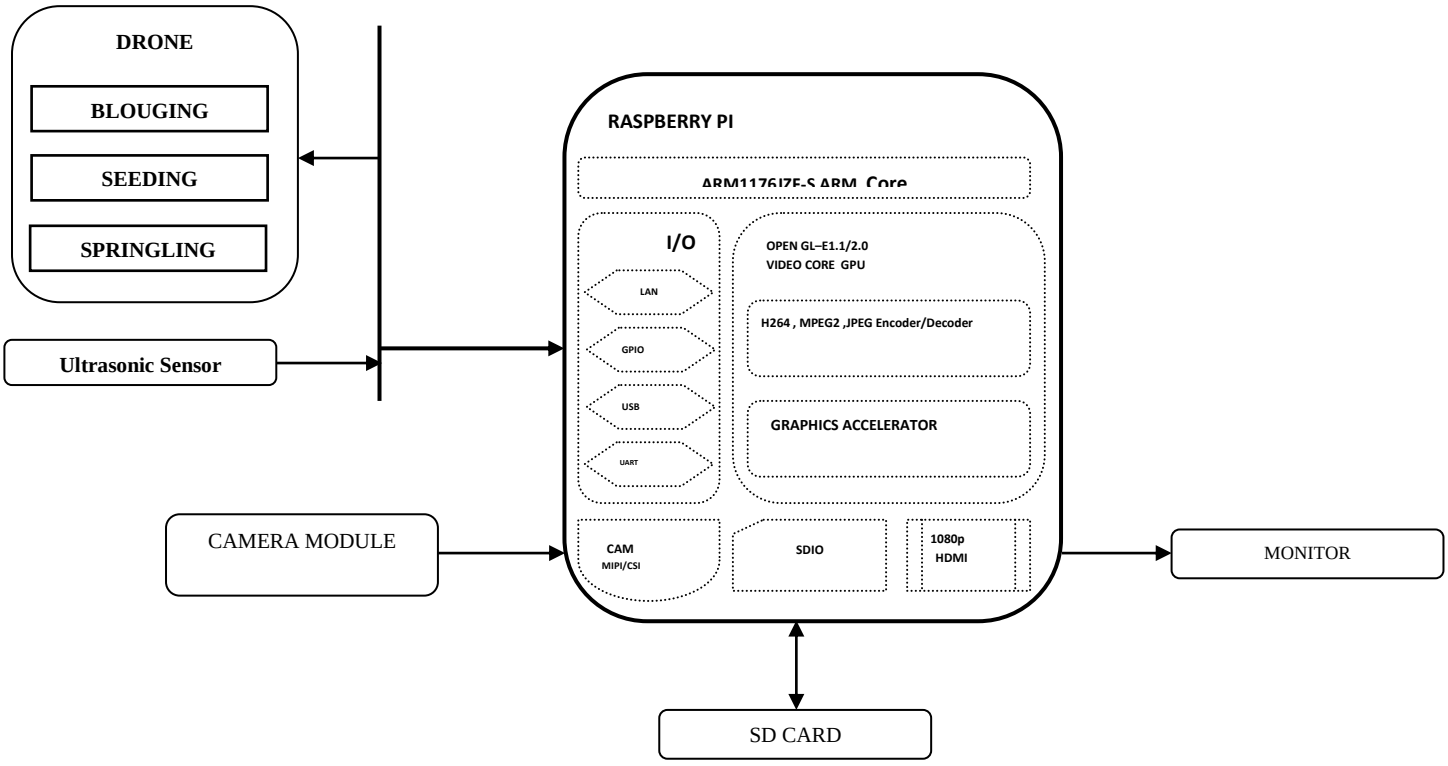
all over the field. It reduces the workload of the farmers and also completes the work very fast.

Literature Survey

Agricultural biota (e.g. seeds, insects, pollen, plant pathogens, etc) may be transported over long distance. It is important to understand the methods and techniques of airborne that transmit through the air, so as to minimize the propagation of unwanted species in crops that are important for human welfare. The long distance transport of biota takes place primarily in the planetary boundary layer (PBL) of the atmosphere- the layer of the atmosphere extending from approximately 50m to 1km above the surface of the earth. Investigator have identified and characterized seeds (Shields et. Al. 2006), insects (shields et. Al. 1999), and fungi in the PBI. One of the attractive techniques for characterizing specific airborne species is to collect samples at different altitudes under a variety of environmental conditions (e.g., day/night, temperature humidity, and wind conditions). One method that enables aerobiological sampling at various altitudes is the use of remotely controlled air craft designed to fly specific patterns and collect aerobiological samples at an altitude of interest. Remotely piloted vehicles (RPV) have been used for aerobiological sampling in agricultural ecosystem. Agents that cause plant disease are thought to travel long distances in the atmosphere and the transport mechanisms are not well understood.

There are two modules in the agriculture monitering system.One module is the flying part while the other module is ground part.

Node 1:



Node 1

The node one is the actual flying module which has various functions implied in it. It is quadcopter with various units on it. The three important units of the flying module are the seeding unit, spraying unit and the surveillance unit. Each unit has its own function and while all the units are controlled by the raspberry pi 3 controllers.

Seeding unit

The seeding unit is for dispersing seeds on the field through the quadcopter. It consists of a servomotor and plate connected to the shaft of the servo motor. The servomotor is given a pulse width modulation and motor rotates step by step. And the plate opens and closes the slot step by step. The seeds are placed in the storing tank in the quadcopter. The outlet of the tank is controlled by plate which is connected to the shaft of the servomotor. The servomotor is controlled by giving pulse with modulation signals from the raspberry pi 3.

Spraying unit

The application of fertilizers and pesticides in agricultural areas is of prime importance for crop yields. The use of aircrafts is becoming common in carrying out the task because of the speed, accuracy and effectiveness in spraying operation. The farmers are using the spraying bags to spray pesticides all over the farm. The farmers have to carry the pesticide spraying bag which makes them get strained. Even then the farmers are unable to evenly distribute the pesticides all over the farm. And also it will be time consuming. The farmer can spray the pesticides using drone evenly all over the field. It reduces the workload of the farmers and also completes the work very fast.

The spraying unit is to identify the pest and to spray the pesticides and to spray the fertilizers. The identification of pests in done by the surveillance unit. The pests are identified by using machine learning. Once the pest is identified the spraying unit is used to spray the pesticides. The pesticides are stored in the storing tank which is placed in the quadcopter. The spray control system is controlled by the raspberry pi 3. The spraying system received a Boolean input from the controller. If the input is true it starts spraying while if its false, then the spraying unit is switched off. It can also be used to detect the weeds and spray weedicides on them. The fertilizers can also be sprayed by using the spraying unit

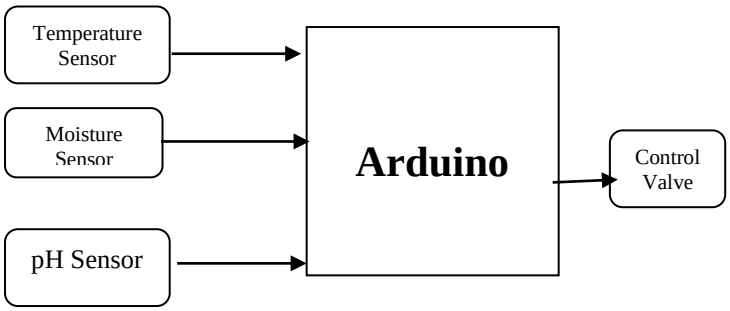
Surveillance unit

The surveillance unit is used for surveillance purpose. It has a camera in it along with multispectral sensor. Camera is used for image processing purpose. The camera captures the image and then the raspberry pi 3 is used to detect the pest and the weeds present on the crops. The camera is wirelessly connected to a system which detects pests based on machine learning. Once the pests are detected the system it sends the control signals to raspberry pi 3 which intern control the spraying unit. It's also used for aerial mapping and emergency response system. It can be used for plant

counting also. The Multispectral sensor is used for plant health measurement and water quality assessment.

In addition to the above three units there is also a ultraviolet sensor which is used to detect the obstacle and thereby avoiding the quadcopter hitting it.

NODE 2:



The node 2 is the ground module. It consists of various sensors which is used for various purposes. Arduino kit is used for controlling the ground module. Arduino IDE is used for coding and Arduino uno controller is used. There are several sensors used in this module and they are temperature sensor, moisture sensor, pH sensor, water level sensor, ldr sensor. Then based on the values of the temperature sensor and pH sensor the valve is opened and closed for irrigation purpose. There is a relay is used to open and close the valve. Temperature sensor is used for controlling the water temperature. If the water is too hot or cold, then the flow of water is stopped as it affects the crops. Similarly, the pH scale of the water is measured and if it is not suitable for the crop then the flow of water is stopped. Moisture sensor is used to detect the moisture content in the field and thereby giving information when the water should be sent for the irrigation. The water level sensor is used to control the amount of water needed for irrigation. The LDR sensor is used for detecting amount of sunlight.

The flow of water is controlled by the controlling value. A flow control valve regulates the flow or pressure of a fluid. Control valves normally respond to signals generated by independent devices such as flow meters or temperature gauges.

Hardware

Drone:

We have used a Generic Eachine H8 Mini RC Quadcopter controller in this drone to control all the movements of the drone. Drone primary controls are pitching, yawing and rolling.

- Pitching: up and down movement.
- Yawing: left and right movement.
- Rolling: rolling on the axis of the drone.

Seeding Unit

- The seeding unit consist of a movable plate fixed to the shaft of the servo motor.
- Pulse width modulation is used to move the plate step by step so that only few seeds are dispersed at a time.
- Ultrasonic sensor is used for obstacle avoiding.
- The whole process of this opening and closing of the slot is controlled by the raspberry pi 3 micro controller.
- Servo motor is responsible for the to and fro movement of the plate.

Spraying Unit:

The spraying unit is used for spraying the pesticides on the weeds that are present on the crops. The weeds are identified using camera and with the help of image processing technique.

The spraying is controlled a relay that is controlled by the raspberry pi 3 controller. Raspberry pi 3 is the most important part of this node. It is responsible for all the actions of the seeding and spraying unit. All the programs are stored in the Raspberry pi 3.

CONCLUSION AND FUTURE SCOPE

Conclusion:

Thus the agriculture is made easy using this project, here using the raspberry pi IOT is also achieved, meticulousness agriculture is made possible with exact physical values sensed by the various sensors and the agriculture is made easy.

Using image processing technique weeds can be spotted easily and using the spraying mechanism the pesticide can be sprayed on the weeds. The seeding process in this project is also an automated process and hence meticulousness agriculture is achieved.

Future Scope:

We in this project have two nodes but in future these two nodes can be integrated together as a single node using just raspberry pi alone. The flight control can be automated in future with more accuracy and good power backup. Harvesting can also be made possible using drones in future. All types of weeds can be spotted by the camera by improvising the image processing technique.

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