Development of High Yield Farming using IoT based UAV

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Abstract: Crop production and crop growth monitoring can be improved using agricultural drone i.e., Unmanned Aerial Vehicle (UAV). Nowadays, due to population growth drones helpful for agriculture become most efficiently. In this paper, by using various sensors and Internet of Things applied in drone for crop production improving, UAV using Raspberry Pi 3B module to displayed in the field with advanced solutions.

Keywords: Internet of Things, Support Vector Machine, Raspberry pi, Sensors, Drone.

1. Introduction

In agriculture, optimization such as seed selection, water supply, fertilizers and pesticides can be done using drones. Drones will helpful in reduction of overall cost in crop production and also secures high yield and crop quality. Due to growth of population and food production faces various problems. Drones used in agriculture to provide solution or efficiency, accuracy and ability to overcome obstacles and it can increased accurate measurement, real time data gathering and efficient crop production[1-4]. By using drones the farmers can able differentiate high and low yield plants available in the fields. In agriculture mainly IoT helps the farmers to fulfill the supply demand gap. IoT concepts applied to drones agriculture and it can help to improve agriculture field[5-8].

In this paper, drone using Raspberry Pi 3B module to displayed the field with advanced solution. Agricultural drones can be used to enhance the crop growth, irrigation, spraying of fertilizers and soil monitoring. Raspberry Pi module is used to provide better agriculture by adaptable technologies and advanced solutions. The need of drones in agriculture crop field for scanning with more spectral image sensors, GPS map creation through onboard camera, heavy weight transportation and domestic monitor equipped camera drone.

Drones can used to measure gap in field, measure water level and irrigation problem, soil variation, detect pesticides, corporal features of crops. A drone provide richer image of their farming field and truth ground information to farmer shown in Figure 1. This technique is useful for improving crop field and farm efficiency[9,10], the drone can survey the crops for farmer of weekly, daily, hourly pictures shows the changes in crop over time, it can improve crop management and production.
2. Related work

Rodrigo Filev Maia et al. explain the various agricultural parameters which are monitored using IoT. The various parameters such as soil temperature, humidity, moisture etc are measured using sensor network. By taking Sao Paulo, Brazil as a reference place the crop life and its sustainability can be predicted based on climatic changes[11].

Y.A. Pederi et al., describes about necessary chemical spraying for crops using drone. It mainly focuses on reduction of cost and pesticide consumption. The developed sprayers have 6BLCD motors. In that sprayer 5L capacity conical chamber consisting of pesticide solution. A DC motor is used to spray the solution in pressurized manner through four nozzles as fine droplets. The process can be controlled by transmitter part at ground level and monitored using camera attached to the sprayer [12].

Deepak Murugan et al exploits about precision agriculture monitoring, it differentiates both thin and dense field data through satellite and drone [13]. Md. Alimuzzaman have proposed agriculture drone. Soil fertilizing, seeding, irrigation and spraying fertilizers can be done using agricultural drones [14].

Fabian N. Murrieta-Rico have proposed accelerometers measurement for drones in agricultural field, the work here proposed to analyze the frequency measurements of the accelerometers output. The proposed model contains simple electronic components, which are integrated in the IMU. So it decreases the time required to measure the accuracy loss [15].

3. Hardware components

Gas Sensor:
A gas sensor is an electronic device to detect the concentration of air in atmosphere shown in Figure 2. In general a normal human can able to identify one trillion types of odours. Similarly the different gas sensors are used to identify odours. From that sensor we can obtain the voltage value to predict the concentration of air. In our project gas sensors are used to identify the ripening of fruits. So that the farmers can able to predict the time of fruits need to be plucked from field.

Level sensor:
It is used to detect the level of water and other liquids that are available in agriculture field. It can measure large changes in water level. It is one of the important sensors and play important role in a variety of industrial application. The main purpose of a liquid level sensor is to monitor and control the level of granular materials.
ADCMPC3008:
ADC MPC3008 is a 10 bit 8 channel analog to digital converter which gets analog input from Raspberry Pi. This chip is a huge option to read simple analog signals. Successive approximation ADC is a type of analog to digital conversion via binary search. It will give us output up to 1023. The output will be a range from 0-1023 means 3.3V.

Raspberry PI model 3B:
Raspberry Pi 3B model shown in Figure 3 is a single board computer used for many applications. This module is used to transfer digital data over internet to any cloud storage area. It is a 64 bit quad core processor having built-in Bluetooth, Wi-Fi and USB modules. The data obtained from cloud storage is used to analyze the information about field. Cameras are fixed in the field to capture images and monitor crop growth, which is controlled by Raspberry Pi.

Figure 3. Raspberry Pi 3B Model

4. Methodology
Screening is a technique to display the particular characteristics using UAV. Using any other techniques like hyper spectral imaging is more difficult to execute. Also compared with other techniques, screening is easy to capture images. It is used to monitor the lack of water and due to change of color in leaves it shows the affected parts in the agricultural field. Figure 4 shows the block diagram of Raspberry Pi integrated with sensors to measure some parameters. The fixing of camera module in drone helps to screening the agricultural field and processing the image. Through this Raspberry Pi 3B module, the monitoring and analyzing of crop in the field can be done. The crop growth can be monitored by using cameras attached with Raspberry Pi. Not reachable areas in disaster zone can be monitored and gather information using drones. Sensors and camera which are connected to controller are used to provide information about crop yield to farmers. The ripening of fruits are identified by farmers using gas sensors which is connected with controller in the field. By using that information the farmers can pick the fruits at exact time. Level sensor is used to measure the water level in the agricultural field. Existing system is integrated with sensors and work according to the updated data's from the sensors in the land field itself.

While other system is used to surveillance all the field using drone automation. It is the combined form of all systems which consist of 24*7 surveillance of agriculture field and crops using sensors and camera which is connected to Raspberry pi processor. Also information exchange between system and the owner made over internet using Internet of things application. In order to design this drone based agricultural yield we can use Raspbian Jessie OS for controller operations and open CV to visualize the images captured by the camera fixed in drone.
5. Implementation
Level and gas sensors are connected with Raspberry Pi to collect the sensed data from the field. Mainly the level sensor is used to predict the moisture content and start the motor to spread the water and gas sensor to predict odour of fruits. The camera is attached to controller to capture field images and send to cloud storage through IoT. The implementation of our project is shown in Figure 5.

6. Conclusion & Future work
The various agricultural parameters are enhanced through monitoring of drones. Different drones are used to monitor crop health, growth, water content in field, pesticide. Drones are used in dense area of field and also increase the yield by accurate monitoring. It can improve productivity and provide live surveillance through internet. Drones are mainly used in any climatic conditions to predict the crop yield. Drones are also use to acquire high precision images about the field in real time to obtain the more yield. Drone can access the crop health and spot bacteria on plant by scanning a crop using both visible and infrared light. Solar panel is the future application. The power consumption can be reduced by using solar panel for charging drones at day time and it can be operated in the field. And also SVM is used for classification of crops. SVM is used to can predict the time of ripening of fruits with sufficient accuracy.

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