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SMART PLANT MONITORING SYSTEM USING IOT

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Abstract - *Agriculture is the backbone of Indian economy as roughly 70-75% of the population depends directly or indirectly on agriculture. The Indian economic growth is directly proportional to the agriculture industry growth. Plant leaves and stems are affects by some insects and diseases. Affected plants reduce the quality and quantity of agricultural profits. Monitoring the condition of the plant plays an important role in successful cultivation of crops in farming. Observation of plant growth and diseases detection through manual process requires huge processing time. With the help of modern technology, image processing methods can be involved in the plant disease detection. In large number of cases affected symptoms were detected on the leaves, stem and fruits of the plant. In this paper we are proposing an algorithm for detecting the dieses and depending upon the types of the diseases, the respective medicine can be given to the crops through an automated prototype.*

Key Words: **Agriculture, Affected plants, Cultivation, Image processing, Diseases detection**

1. INTRODUCTION

An automated system for monitoring the growth of plant can be done with appropriate taxonomies. This work combines Image Processing and IOT to monitor the plant and to collect the environmental factors such as humidity, insects, soil and temperature. In image processing, a recognition system capable of identifying plants by using the images of their leaves, stem has been developed and with the help of the image compare with previous plant images. Identify the problem in database and find it. Then choose the rectified natural pesticides and spread to the affected plants.

1.1 Proposed System

In this method we use the natural pesticides instead of chemical pesticides. In existing system, they used arduino to control the system. It accesses only some specific functions. We use raspberry pi for control the whole system efficiently. Raspberry pi is small single board computer. The Servo Motor is used to rotate the camera left side and right side. Ultrasonic sensor is used to detect the obstacles nearby the rover. Pi camera is used to capture the image of the plant leaves and stems.

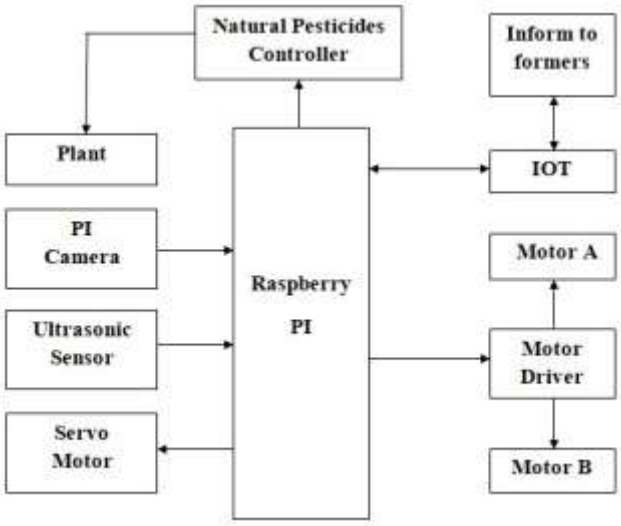

Fig- 1: Proposed diagram

1.2 Working Principle

In image processing, a recognition system capable of identifying plants by using the images of their leaves, stem has been developed and with the help of the image compare with previous plant images. Identify the problem in database and find it. Then choose the rectified natural pesticides and spread to the affected plants. The different features that are extracted and compared are color, texture and shape of the leaf. Here we combine IOT and Image processing. In addition, our system is simple to use, fast and highly scalable.

2. MATERIALS AND METHODS

We are using Raspberry pi, Motor Driver, DC Gear Motors, Servo Motor, Ultrasonic Sensor and Pi Camera for this project. Raspberry pi is the microcontroller, which control over all system and send information about the plant to former.

2.1 Raspberry PI

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not

include peripherals or cases. However, some accessories have been included in several official and unofficial bundles. The Raspberry Pi is a capable little computer which can be used in electronics projects, and for many of the things that your desktop PC does, like spreadsheet, word processing, browsing the internet, and playing games.

Fig- 2: Raspberry Pi

2.2 Motor Driver

The L298N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The L298N module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A. The module has two screw terminal blocks for the motor A and B, and another screw terminal block for the Ground pin, the VCC for motor and a 5V pin which can either be an input or output.

Fig- 3: Motor driver L298N

2.3 DC Gear Motors

A Direct Current (DC) motor is a rotating electrical device that converts direct current of electrical energy into mechanical energy. An Inductor inside the DC motor produces a magnetic field that creates rotary motion as DC voltage is applied to its terminal. Inside the motor is an iron shaft, wrapped in a coil of wire. This shaft contains two fixed, North and South, magnets on both sides which cause both a repulsive and attractive force, in turn, producing torque. Speed of a DC motor can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. A gear motor is an combination of a motor and gearbox. The addition of a gear head to a motor reduces the speed while increasing the torque output.

Fig- 4: DC Gear motor

2.4 Servo Motor

A servo motor is an electrical device which can push or rotate an object with great precision. It is a combination of DC motor, position control system, gears. The position of the shaft of the DC motor is adjusted by the control electronics in the servo, based on the duty ratio of the PWM signal the signal pin.

Fig- 5: Servo motor

Servo motor is used to rotate and object at some specific angles or distance. It is just made up of simple motor which run through servo mechanism. All Servo motors have three wires coming out of them. Out of which two will be used for Supply and ground, and remaining one will be used for the signal that is to be sent from the MCU.

2.5 Pi Camera

The Raspberry Pi camera module can be used to take high definition video, as well as stills photographs. The Pi camera module is a portable light weight camera that supports Raspberry Pi. It communicates with Pi

using the MIPI camera serial interface protocol. It is normally used in image processing, machine learning or in surveillance projects. It is commonly used in surveillance drones since the payload of camera is very less. Apart from these modules Pi can also use normal USB webcams that are used along with computer.

Fig – 6: Pi camera

2.6 Ultrasonic Sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns. Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Ultrasonic sensor, like many others, uses a single transducer to send a pulse and to receive the echo.

Fig- 7: Ultrasonic sensor

3. SYSTEM IMPLEMENTATION

In below Fig-8 consist of motor driver, ultrasonic sensors, Geared motors, servo motor and pi camera. The motor driver used to control the geared motors with our coding. The ultrasonic sensor used to sense the distance of the object and it used to for obstacles avoiding function. The servo motor is used rotate the pi camera for capture the both right and left side of the plants. After capturing the image, the background python coding can compare the captured image with the database image. If both are not same for their manner it sends the image and respected problem to the farmer mobile

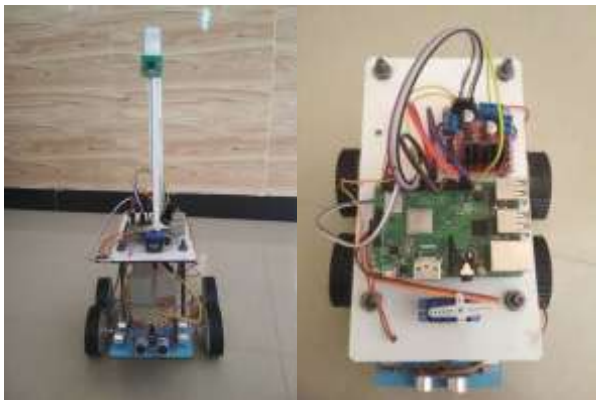

Fig- 8: Front and top view of Rover

The comparisons are made by writing code to the raspberry pi. It is achieved with prominent results by acquiring the images of agriculture land. The image is then filtered by applying mean filter algorithm to remove noise created by various lighting conditions. The filtered image is then segmented and processed by image processing technology to extract the information.

4. CONCLUSION

In this project, connects raspberry pi to the PI camera and write python coding with the help of Python IDE editor. Observe plant leaves and stems by capturing the image by PI Camera. In image processing, a recognition system capable of identifying plants changes by using the images of their leaves, stem has been developed and with the help of image comparisons with previous plant images.

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