Poly-House Plant Health Indication and Detection Automatically using Image Processing and Sensor

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Abstract— The autonomous robot camera device is used here. The camera is able to detects the leaf diseases by observing the black lines on them, using line follower image algorithm. Different sensors are used here such as soil fidelity, LM 35, humidity, and Light sensors for controlling and monitoring plant house. The Robot camera detects an image is in the form of JPEG, sends to ARM controller by using Zigbee Transmission theory in a long distance away from plants. The detected system is scanned over for diseases and automatically controlling action is done. The camera also monitors the another sensor such as to control the motor drive by the SPDT relays also.

Key words: Robot camera; plant health; agriculture; controlling; detection

I. INTRODUCTION

We live in a world where everywhere can be controlled and operated automatically, but there are still a few important sectors in our country where automation has not been adopted. Agriculture has been one of the primary occupations of man since early civilizations and even today manual interventions in farming are inevitable. Greenhouses is important part of the agriculture and horticulture sectors in our country as they can be used to grow plants under controlled climatic conditions for optimum produce. In the greenhouse envision monitoring and controlling of the climatic parameters which directly or indirectly govern the plant growth and hence their produce. Automation means the process is control by the machine without human interference require minimum human operators. The main function of a automation polyhouse is to create the optimal growing conditions for the full lifecycle of the plants. Using automation system we measuring parameter at polyhouse helps to monitor all the necessary parameters for creating the optimal environment in the greenhouse. The robot with sensors network is capable of driving to the end and back along crop rows inside the greenhouse. It introduces a wireless sensor networking that was used for the purpose of measuring and controlling the greenhouse application. For traditional climate monitoring and control systems, all sensors are mounted on robotic vehicle in the poly house and connected to the device performing the control tasks. The robot also has watering mechanism it will provide water to the plants according to their requirement by observing soil moisture and humidity. It also detects the plant disease and provides the necessary pesticide according to the type of disease.

II. SYSTEM DESIGN

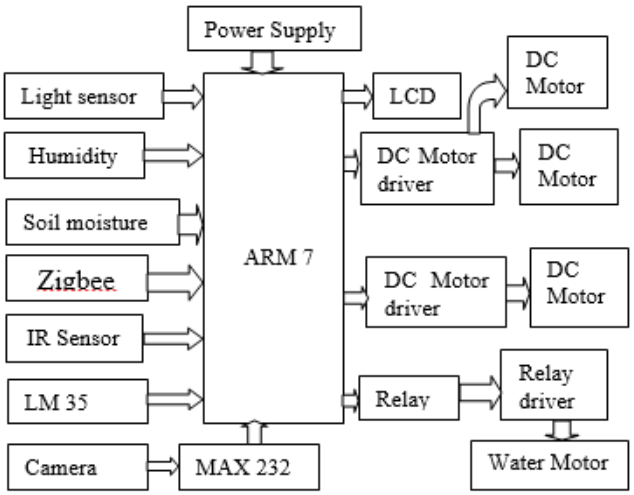

Fig. 1: Propose System

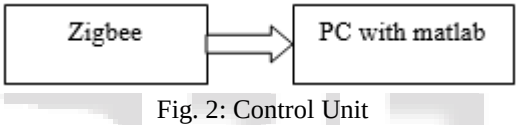

Fig. 2: Control Unit

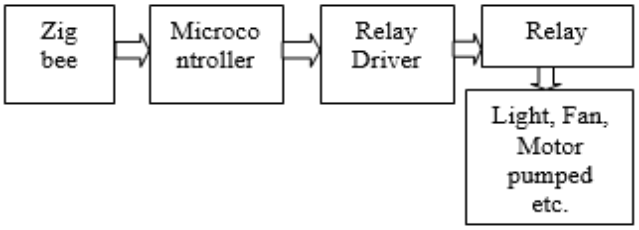

Fig. 3: Control System

In this project we are designing the plant health indication automatically using Robot camera which will sense the conditions in real time. For this, we are observing parameters such as temperature, humidity, soil moisture etc. The Robot camera will have able to detect the water equipment and provide if necessary.

A. *Power Supply*

Power supply is relevant part of our project. Virtually every piece of electronic equipment, most of equipment requires DC voltage but voltage that is also well filtered and regulated.

B. *Zig-bee Module*

The Zig Bee /X Bee-PRO ZB RF Modules are designed to operate within the ZigBee protocol and support to needs of low-cost, low-power wireless sensor networks. It is use for data transmission and receiver.

Fig. 3: X Bee /X Bee-PRO ZB RF Modules

C. IR Sensor

Infrared sensor is used to detect impede in front of the robot or to differentiate between colors depending on the configuration of the sensor. An IR sensor consists of an emitter, detector & associated circuitry. The circuit require to make sensor consists of two parts emitter circuit and receiver circuit.

Fig. 4: IR sensor

D. LM35

National Semiconductor's LM35 IC has been used for sensing the temperature. It is used to measure temperature with an electrical output proportional to the temperature (in ^{0}C). The temperature can be measured more accurately with it than using a thermistor.

E. Humidity Sensor Module (SY-HS 220)

The humidity sensor HIH4000, manufactured by Honeywell is used for sensing the humidity. It delivers instrumentation quality RH (Relative Humidity) sensing performance in a low cost, solder able SIP (Single In-line Package). Relative humidity is a measure, in percentage, of the vapour in the air compared to the total amount of vapour that could be held in the air at a given temperature.

Fig. 5: Humidity Sensor Module

F. Soil Moisture Detection Module

This is a simple and easy moisture sensor which is used for the detection of soil moisture. The output of module is at high level, hence soil moisture is detected. Using this sensor, it provides the watering mechanism automatically when required to the plants or crops in the poly house. Due to this the continuous requirement of labours are diminish.

G. Camera (RG-CAM-1)

Camera used to capture the image of leaf of plant and also detect the diseases of plant through image processing.

H. ARM 7 Controller

ARM controller is heart of our system and used as the hardware platform. It is the controlling unit depending on input signal it provides the appropriate signal to the output device for taking the action.

I. Relay

A relay is an electronic switch that opens and closes under the control of another electrical circuit. The switch is operated by an electromagnet to open or close one or many sets of contacts. Because a relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier.

J. ARM controller

ARM controller is used as the hardware platform. It is the control the parameter, to which all other components are connected.

K. LDR

Light Dependent Resistor (LDR) also known as photoconductor or photocell, it is a device which has resistance which varies with the amount of light falling on its surface.

L. LCD Display

A liquid crystal display (LCD) is use to display the status of relay, it is a thin, flat display device made up of any number of color or monochrome pixels. It is the output device.

III. Plant Health Detection and Indication

Because of pathogenic bacteria, fungi, viruses, and phyto-plasmas diseases of polyhouse which affect the heath of plant. If a disease is imagining and a pesticide is applied to counteract the situation caused by an abiotic stress, then undo expense, labor, risk has occurred.

In the planning an Integrated Pest Management (IPM) program for disease control includes sanitation techniques, monitoring techniques, and management strategies. Pesticides should only be used when observing data which are appear on control unit reveals that they are required. The use of pesticides as a first response to a disease outbreak is typically due to poor planning. The object of a successful IPM program should include five key components; prevention, regular monitoring, accurate diagnoses, appropriate action thresholds, and effective management methods.

In this system, robot detect various diseases taking place in polyhouse crops and also provides the necessary pesticide required for it according to the prerequisite. Various types of diseases taking place in poly house Ralston Wilt, Foliar Nematodes, Crops Viral Diseases, Leaf Diseases, Downy Mildew, etc.

IV. CONCLUSION

The agricultural system designed is an open system. By using detection system algorithm, we monitor the leaf diseases and control by the sensors. The camera also sends an image to the farmers through the zigbee module. The IR sensors are used to give artificial light in rainy and winter seasons for the photolithographic process of plants tissues. The proposed system is reliable system and less costly. The need of workers is reduced by by using this image processing and sensors.

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