Plant Health Monitoring System Using Image Processing

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Abstract: *During the course of this project we made an attempt to scale down human labour by creating a system which is able to indicate plant health. Essentially the aim of this project is creating a monitoring system which is able to work on the following principle which indicates the plant health by observing colour of their leaves. Disease detection involves the steps like image acquisition, image pre-processing, image segmentation, feature extraction and classification.The system will note encompassing environmental conditions like temperature, humidity, moisture etc. and it'll be displayed on LCD display and image processing is used for the detection of plant diseases.*

Keywords *–Disease detection, Image processing, Environmental conditions.*

I.   Introduction

In this project, we are going to make an automation system which uses vision based row guidance method to drive through the row crops. Ultimately, a unique system has been described for plant & Food Research which makes use of a number of Electrical And Computer Systems Engineering theories. A prototype automation systemic arm has to be designed, developed and constructed, which should be integrated with motors, controllable using specific electronic components and custom computer software. A number of sensors are integrated into the automation systemic system including color, proximity, Temperature and Humidity Systems.

II.   System Analysis

a.   PresentSystem

In [Ramakrishnan.M, Sahaya Anselin Nisha. A, IEEE ICCSP 2015 conference] the color imaginary transform, color co-occurrence matrix, feature extraction will be done and get a efficiency output with neural network, Back propagation gives efficient ground nut leaf detection with complex background, in this work we classified only four different disease with 97 Al % of efficiency. But in future the work carried out more diseases by using this method.[1]

[Sachin D. Khirade, A. B. Patil, 2015 International Conference on Computing Communication Control and Automation] they discussed various techniques to segment the disease part of the plant. This paper also discussed some Feature extraction and classification techniques to extract the features of infected leaf and the classification of plant diseases. From these methods, we can accurately identify and classify various plant diseases using image processing techniques.[2]

[Rajleen Kaur, Dr. Sandeep Singh Kang, 2015 IEEE 3rd International Conference on MOOCs,], they discussed the study of detection of plant diseases and detection of infected part of plants. Initially input images are taken and then image processing is started. Background and Black pixels are both segmented in first step. They also discussed how hue and satuaration part of the image is separated.[3]
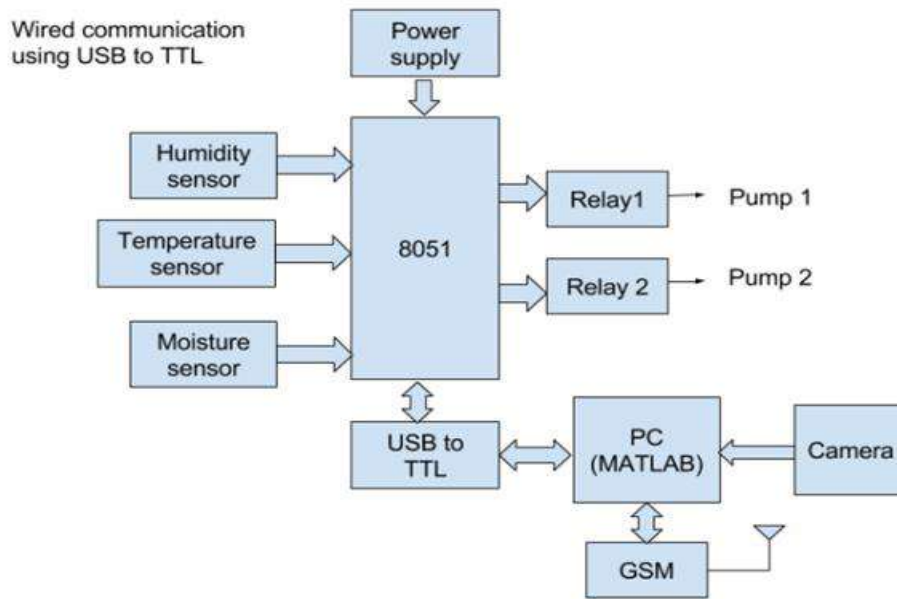
b. ProposedSystem

Fig 3.1 System Block Diagram

The system starts when all the sensors react to the environment. The output of the sensors is an input to the microcontroller. According to the input to the microcontroller, decision is taken whether to use pump 1 and pump2. Relay is used because it can convert small voltage to amplify that voltage that can be input to the pump.

On the other end, Camera starts working and it captures the photos of leaf. Camera then send the photo to pc(MATLAB) where no of holes are detected using blobing and RGB technique. According to that, the microcontroller communicates with PC using USB TTL. Accordingly, a message is sent to the farmer whether to turn on the pump or not based on the conditions in the microcontroller

II. Methodology

- The system monitors the condition of the leaf under review.
- Simultaneously, the system checks the environmental conditions such as temperature, humidity and moisture.
- If the system detects any fault in the leaf, it will send an SMS through GSM to the farmers.
- If the system finds any change in temperature or moisture, it will switch on the RELAY and again sends an SMS.

III. Design

The microcontroller is switched ON as soon as the power is given to the microcontroller circuit. It receives information analysed from the temperature, humidity and moisture sensors and displays it on the LCD screen. Next, the camera is initialized using Matlab code and the image of a plant leaf is captured on a plain background (white background suitable to obtain best results) with steady position and angle of camera. The program analyses the captured image by obtaining RGB ratio and converting it into gray scale image. After the image acquisition the image processing is done to detect the colour changes and holes present if any using colour detection and blob detection techniques respectively.

The program then analyses the image and displays the fault if any. For eg: 1 hole detected and discoloration of leaf. The PC sends this output as a message to the microcontroller and the microcontroller further carries out the work based on this analysis. When a fault is detected, the microcontroller sends a small voltage to the relay which initialises the working of the relay which in turn switches ON the fertilizer and water pumps.

IV. Conclusion

The proposed system is open architecture so anyone can make this type of system using any way or path. The system uses image processing to observe the leaf color which increases further accuracy of the system as it identifies color very accurately than human. The system also observes different environmental conditions such as humidity, soil moisture and temperature which human cannot measure accurately by open eyes to decide the plant health so the accuracy of the system is high. It also involves watering mechanism which reduces human labor and we can reduce labor and notifies to farmer about the abnormal conditions. Further by modifying the system further for other agricultural work such as picking, harvesting, weeding. From reference of other papers, we can infer that we can use microcontrollers, sensors and digital camera we can make an automated system for plant health monitoring

Acknowledgment

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