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Detection of Musa leaf diseases using image processing and monitoring plant irrigation system

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ABSTRACT

This paper presents a method for early detection of leaf diseases in plants based on some important features extracted from its leaf images. It is interfaced with a digital camera or web camera which is used to detect the diseases in leaves. In this system, images of leaves are captured and compared with image healthy leaves images which are in database that are pre-stored in the device. After image processing, if the plants are found infected, this device automatically turns on the valves, through which medicine supply is enabled or disabled automatically to the plant area through a sprinkler or drip irrigation method. In addition to this, soil moisture and temperature sensors are used to avoid the spreading of diseases due to change in climatic conditions. If the values of moisture/temperature exceed the predefined range, the Beagle bone Black enables auto-medicating to the plants.

Keywords: Auto-medicating, Disease.

INTRODUCTION

Agriculture plays a major role in all country. Major part of the growth rate depends on agriculture alone. Plants diseases cause major production and economic losses in agriculture. Identification of the plant diseases is the key to prevent the losses in the yield and quantity of the agricultural product. The discovery of the plant diseases mean the finding of visually noticeable patterns seen on the plant leaves. Monitoring and disease detection on plant is very difficult for sustainable agriculture. Farmers require continuous monitoring of experts which might be prohibitively expensive and time consuming. It is very difficult to monitor the plant diseases manually. Looking for fast, very cheap and accurate method to automatically find the diseases from the symptoms that appear on the plant leaf is of great realistic significance. In addition to this supplying

medicines or pesticides to the infected plant area manually is a difficult task.

The main objective of this project is to monitor the plant health and detect the plant leaf diseases based on the texture of the leaf at the early stage in order to reduce spreading of diseases by enabling Auto-medicine to the plants through Beagle bone Black. The camera which is interfaced to the Beagle bone black captures the leaf images continuously and compares it with the leaf's database. If there are any changes then auto-medicating is employed depending upon the conditions.

In addition to this, soil moisture and temperature sensors are used to avoid the spreading of diseases due to change in climatic conditions.

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spreading of diseases due to change in climatic conditions. If the values of moisture/temperature exceed the predefined range, the Beagle bone Black enables auto-medicining to the plants. We identify the diseases that commonly occur in the plants by the characteristics of the leaves like colour and its nature. By comparing the leaf that is affected by the virus with the healthy leaf it is possible to identify the disease of the plant. We present the detailed design of an efficient system that uses Beagle Bone Black device which helps in detection of disease using image processing technology. In this proposed system, Bhattacharyya Distance algorithm is applied on the image acquired which helps in identifying the disease of a plant.

LITERATURE SURVEY

N. Valliammal presents this paper concentrated on the prehandling advance of CAP-LR. Leaf pictures typically changes to obscured pictures by the nearness of clamour and low or high complexity both in the edge zone and picture region. In this paper, an approach that upgrades limits and the same time modifies differentiation is introduced. As different clamour harms the nature of nature pictures, enhanced upgrade strategy is

required for enhancing the differentiation extend in leaf pictures.

S. Ananthi S. Vishnu Varthini argued that an application of texture analysis in finding the plant diseases has been explained. Finding the disease is mainly the purpose of the proposed approach. The experimental results indicate the proposed approach can recognize the leaf diseases with little computational effort. Automatically detect the diseases from the symptoms that appear on the plant leaves are the research topic is mentioned in this paper. Advancement of this project is to increase the recognition rate of classification process.

Arunkumar beyyala and Sai Priya beyyala presents Crop ailments are caused by pathogens growths, infection and microscopic organisms however there is an issue of mansided quality of visual example. Ailment is caused by pathogen which is any operator to cause sickness. Majority of the cases characteristics or sicknesses are seen on the leaves or stems of the plant. Along these lines distinguishing proof of plants, leaves, stems and afterward discovering the infections, level of the ailment occurrence. Subsequently there was a colossal interest for particular and refined picture designs understanding.

BLOCK DIAGRAM

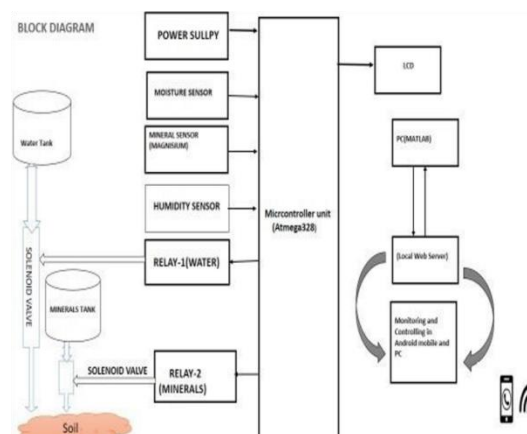


Fig.3 Block Diagram

ALGORITHM

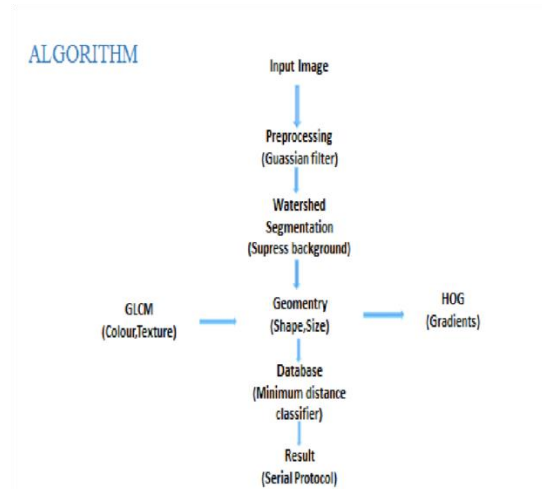


Fig.3.1 Algorithm

Potassium sensor

Potassium selective electrodes are a type of ion selective electrode used in biochemical and biophysical research, where measurements of potassium concentration in an aqueous solution are required, usually on a real time basis. These electrodes are typical ion exchange resin membrane electrodes, using valinomycin, a

potassium ionophore, as the ion carrier in the membrane to provide the potassium specificity. This type of ionselective electrode is subject to interference from (in rubidium, caesium, ammonium, sodium, calcium, magnesium, and lithium).



Fig.3.2 Potassium Sensor

Phosphorus sensor

Phosphorus sensor is an optical method for surface temperature measurement. The method exploits luminescence emitted by phosphor material. Phosphors are fine white or pastel-coloured inorganic powders which may be stimulated by any of a variety of means to luminesce, i.e. emit light. Certain characteristics of

the emitted light change with temperature, including brightness, colour, and afterglow duration. The latter is most commonly used for temperature measurement. Lesions enlarge and then look like as dry dead spots as shown in figure, example bacterial leaf spot have brown or black water-soaked marks on the foliage, sometimes with a yellow halo, generally identical in size. In dry conditions the spots have a freckled appearance.



FIG 3.3 Phosphor Sensor

SYMPTOMS

There are some common symptoms of fungal, bacterial and viral plant leaf diseases,

Bacterial disease symptoms

The disease is characterized by very small pale green spots which can be observed when water-soaked. The lesions enlarge and then look like as dry dead spots as shown in figure, example bacterial leaf spot have brown or black water-soaked marks on the foliage, sometimes with a yellow halo, generally identical in size. In dry conditions the spots have a freckled appearance.

Viral disease symptoms

Among all plant leaf diseases, those caused by viruses are the most difficult to diagnose. Viruses produce no tell-tale signs that can be readily observed and often easily confused with nutrient deficiencies and herbicide injury. Aphids, leafhoppers, whiteflies and cucumber beetles insects are common carriers of this disease, example, Mosaic Virus, Look for yellow or green

stripes or spots on foliage, as shown in figure. Leaves might be wrinkled, curled and growth may be stunted.

Fungal disease symptoms

In all plant leaf diseases, those caused by fungus few are discussed below and shown in figure, example late blight caused by the fungus *Phytophthora infestans* shown in figure. It first appears on lower, older leaves like water-soaked, grey-green spots. When fungal disease grown-up, the spots become darken and then white fungal growth forms on the down side of the leaf. Early blight is caused by the fungus *Alternaria solani* shown in figure. It first appears on the lower side of the leaf, on older leaves like very small brown spots with concentric rings that form a bull's eye pattern. When disease grown-up; the leaf becomes yellow due to an outward increment of the disease. In soft mildew yellow to white spots on the above surfaces of older leaves occurs. These regions covered with white to greyish on the undersides as shown in figure



Figure1: Early stage



Figure2: Late stage

LIQUID CRYSTAL DISPLAY

16×2 Character LCD is a very basic LCD module which is commonly used in electronics papers and products. It contains 2 rows that can display 16 characters as shown in the below Figure 2.3. Each character is displayed using 5×8 or 5×10 dot matrix. It can be easily interfaced with a

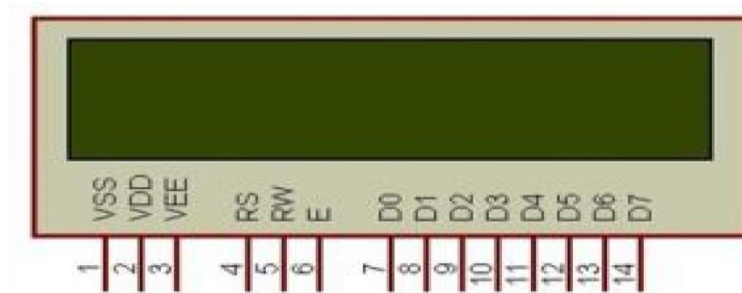


Figure 2.3 16×2 LCD Pin Diagram

This is the pin diagram of a 16×2 Character LCD display. As in all devices it also has two inputs to give power Vcc and GND. Voltage at VEE determines the Contrast of the display. A 10K potentiometer whose fixed ends are connected to Vcc, GND and variable end is connected to VEE can be used to adjust contrast. A microcontroller needs to send two information to operate this LCD module, Data and Commands. Data represents the ASCII value (8 bits) of the character to be displayed and Command determines the other operations of LCD such as position to be displayed. Data and Commands are sent through the same data lines, which are multiplexed using the RS (Register Select) input of LCD. When it is HIGH, LCD takes it as data to be displayed and when it is LOW, LCD takes it as a command. Data Strobe is given using E (Enable) input of the LCD. When the E (Enable) is HIGH, LCD takes it as valid data or command. The input signal R/W (Read or Write) determines whether data is written to or read from the LCD. In normal cases we need only writing hence it is tied to GROUND in circuits shown below.

PROPOSED METHODOLOGY

The proposed methodology includes detection of plant leaf diseases at early stage and enabling

microcontroller. In this tutorial we will see how to write data to an LCD with PIC Microcontroller using Hi-Tech C Compiler. Hi-Tech C has no built in LCD libraries so we require the hardware knowledge of LCD to control it. Commonly used LCD

displays uses HD44780 compliant controllers.

and disabling of medicines/pesticides automatically.

ADVANTAGES OF PROPOSEDSYSTEM

Plant diseases can be detected at early stage. And Spreading of diseases can be avoided. Information about the plants and system will be intimated to the user through GSM interfacing. Automatic enabling of medicine supply to the infected plants area. This can be programmed to all kind of leaves depending upon our requirement.

CONCLUSION

The proposed IoT system helps in early detection of disease in plants. If any diseases are detected, auto-medicining is enabled by turning on the valve and medicine is sprayed through sprinkler to the agricultural farm. Embedded system for automatic medicining to an agriculture field offers a potential solution to support site specific irrigation management that allows producers to maximize their productivity by detecting the diseases at early stage.

In addition to this, soil moisture and temperature sensors are used to minimize the

spreading of diseases due to change in climatic conditions. If the values of moisture/temperature exceed the predefined range, the Beagle bone

Black enables automedicining to the plants. It can be programmed to any kind of leaves depending upon the user requirement.

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