International Journal of Engineering & Technology, 7 (2.24) (2018) 188-190

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Monitoring and Controlling the Infected Cereal Crops Based on Image Processing with Proposed Architecture

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Abstract

Agriculture is the backbone of our country. Agriculture is the science of cultivating the soil, harvesting crops, and raising livestock which is considered as one of the economic activities in Asian countries. In India, sector of agriculture is destroying now-a-days .The main goal of this project is to increase the productivity and profit. There are several automated systems available in literature, which are developed for irrigation control and environmental monitoring in the field. However, it is essential to monitor the plant growth stage by stage and take decisions accordingly. In addition to monitoring the environmental parameters such as pH, moisture content and temperature, it is inevitable to identify the onset of plant diseases too. To prevent the losses occur in agriculture production. Plant disease identification by continuous visual monitoring is very difficult task to farmers and at the same time, it is less accurate and can be done in limited areas. Hence, this project aims to develop an image processing algorithm to detect the diseases in the rice plant. Rice blast disease occurs in rice plant due to magnaporthe grisea and this disease also occurs in wheat, rye, barley, and millet. Due to rice blast disease, around 60 million people were affected in 85 countries worldwide. Image processing technique is adopted as it is more accurate. Early disease detection can increase the crop production by inducing proper pesticide usage. Hardware prototype of the proposed system will be developed using the Arduino Processor.

Index Term: *Transmitter, Receiver, Wireless Personal Area Network, Arduino, Motor Driver and Water Pump.*

1. Introduction

The backbone of our country is agriculture. The Agriculture sector in India plays a major role in the economic development. The mainframe of crops from initial stage to harvest stage gradually increases.Crops like rice which is considered as the Nations' most important product as it is one of the stable foods and cereal crops. Owing to this, many efforts have been taken for the safety of this crop by monitoring. This crop is affected by various diseases such as RBB (Rice Bacterial Blight), RB (Rice Blast), RBS (Rice Brown Spot), RSR (Rice Shrath Rot).Farmers uses the most pesticides to the crop for precautions which make more harmful to all living organisms,it acts as bioaccumulation.It create more diseases such as cancer,diabetics etc in the early stage. The observation and recognition of the diseases is the most necessity for applying the pesticides. From initial stage, pests can't identified in the production ,it will cause adverse effect. The intention of the project is to develop an image processing technique that can identify the diseases at the starting stage. The system also monitors the environmental parameters automatically.

- Database of plant diseases, nutrient deficiency within the specific time span.
- Increase in the yield and crop production involves continuous monitoring and early identification of the disease onset.
- Provides an efficient low cost decision support system.

2. Related System Analysis

Till now, there is no early detection of plant leaf diseases. Farmers use too much of fertilizers and pesticides in the name of precaution which make the vegetables and fruits more toxic. People, who consume this, will result in becoming diabetic or even may even encounter cancer. Manual detection is not accurate. So, the productivity of cultivation decreases. In our proposed system, the automatic detection of diseases is done using the image processing techniques.The main drawback in the previous work is continous monitoring of the crop is not possible.

Fig. 1 : Types of plant diseases

3. Working Design

In this project, each unit is fixed with camera and this camera takes a photo daily and checks it with the already stored images. The camera is attached to the microcontroller. A tub of good water

is connected to the microcontroller by means of water pump and a tub of medicines is connected to the microcontroller by means of a pump. The image is checked daily. If the input image is a good leaf image, the water pump will get switched ON and if the image is an infected image, the medicine pump gets switched ON.
The image acquisition comes under image processing. The next step is the preprocessing where the leaves are collected from the agriculture field and the leaves are sent to the pixel intensity test to identify the infected leaves based on the colour variation. The next step is detecting the crop image by correlation which is based on separating the good crop from the infected crop. Thereby, detecting the pathogen affected region from the difference image and highlighting the pest image.

4. Hardware Setup

The hardware system consists of following parts :

- ARUDINO Microcontroller
- 16x2 LCD Display
- Water Pump
- Motor Driver

Monitoring Unit

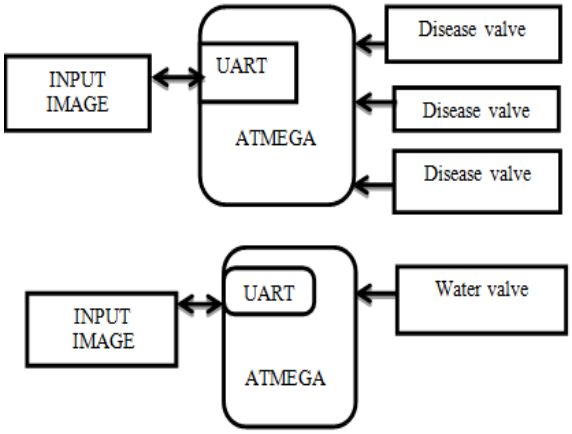

Fig. 2: Block Diagram of the Monitoring Unit

Arduino Microcontroller

The choosen of controller in the present paper is ARDUINO UNO.It based on ATMEGA 328. It consists of 14 digital input and output pins. Out of these,6 analog pins. Information related to crop database that can be stored in the controller.Water pump and medicine pump is connected in the controller.LCD is used to show up the status of the pest.It will be connected in the controller.Motor drive which is wired in the controller to supply medicines to the infected crop.

Fig. 3: Arduino Microcontroller

Proteus Software

In this project, the proteus software is used which is one of the operating systems that drives on the personal computer to develop microcontroller.

Timer

The timer switch gives information about time, duration, protocol, etc. This is a very important part of the microcontroller. In this project, the concept of timer unit is used to set the time to supply water for the good crop and medicine for the infected crop depending upon the supply product, the motor runs. The PH sensor is used in this project to estimate the acidic and basic ratio in the medicine.

Motor Driver

In this project, two types of motors are used; one is used for supplying water to the good crops and the other one is used for supplying medicine to the infected crops. When the LCD display shows the crop is a good one, the LED light does not blink. The motor runs and supplies water. When the LCD interface displays the result of the infected image of the crop, the LED light blinks the motor runs and supplies the medicine depending upon the type of disease occurred.

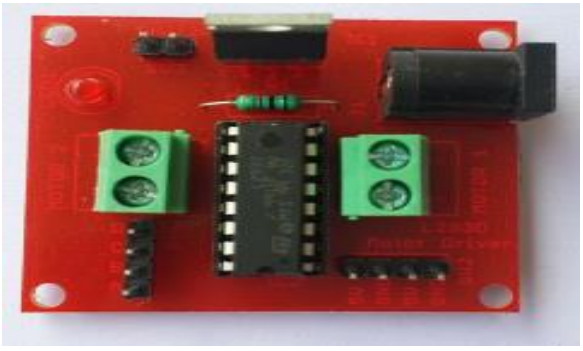

Fig. 4: Motor Driver

5. Proposed Model

In our system, each and every individual water meter is been grouped by an individual network called WPAN (Wireless Personal Area Network). Each unit is fixed with camera and this camera takes the photo daily and check with the already stored in puts images. Camera is attached to the microcontroller. A tub of good water is connected to the microcontroller by means of a water pump and a tub of medicines has been connected to the microcontroller by means of a pump. Image is checked daily. If the input image is that of
a good leaf image, the water pump will get switched ON and if the input image is a infected leaf image, the medicine pump gets switched ON.

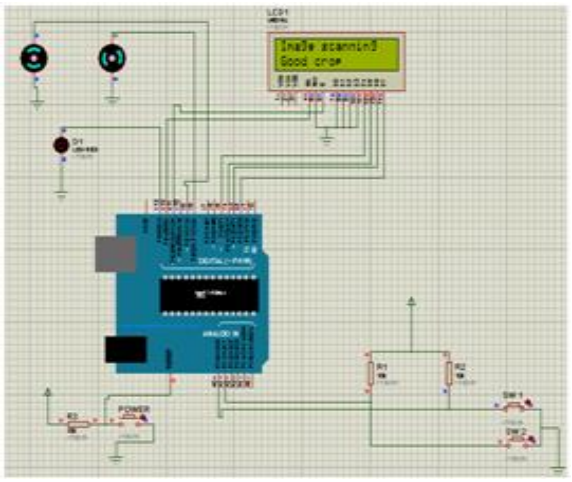

Fig. 5: Simulation Result for Good Crop

In this simulation result, the LCD interface displays the result of the good crop. So, the motor runs and supplies the water.

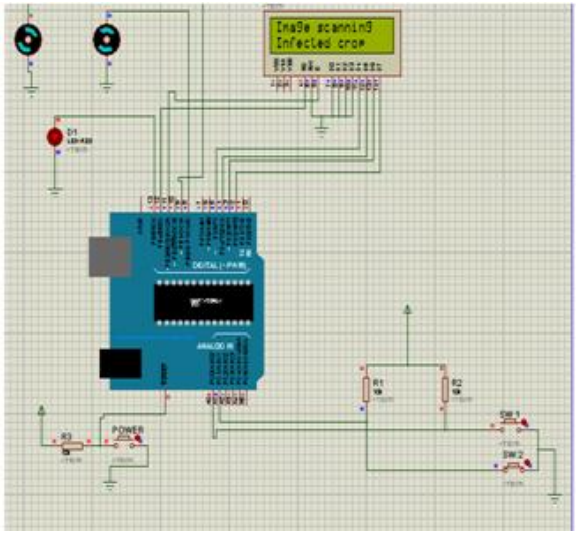

Fig. 6: Simulation Result for Infected Crop

In this simulation result, the LCD displays the infected crop. The LED blinks and the motor runs to supply medicine to the infected crop.

Table 1: Simulation result table

	AGRICULTURE		
	At Normal Condition		
Good Crop	Infected Crop	LED	MOTOR
1	-	LED OFF	Motor runs(water)
-	1	LED ON	Motor runs(medicine)

The simulation table describes the working condition in the agriculture field. At normal condition, the camera which scans the field and gives database to the microcontroller when there is no infected crop observed the water supplies automatically. At abnormal condition, when camera scans the infected crop, the microcontroller drives the motor so that suitable medicine is supplied to the crop depending upon the diseases affected.

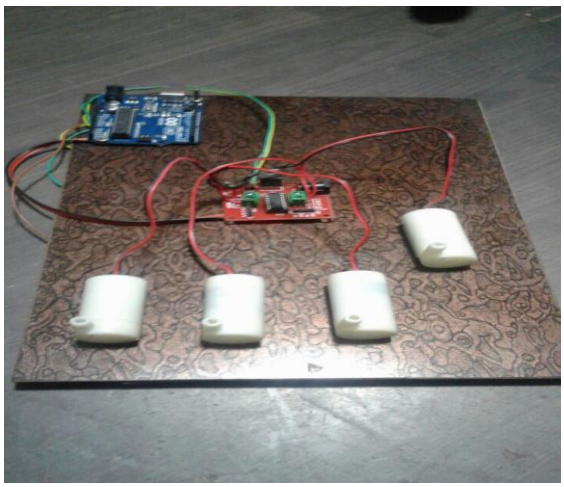

Fig. 7: Hardware Result for Watering Pump

In this hardware result, four types of watering pump are used. Two pumps which are used to supply water for good crop automatically and the remaining two pumps are used to supply medicine to the infected crops. The Arduino microcontroller is connected to the motor drive. The motor drive is used for operating the motor based on the type of the crop.

6. Conclusion

The objective of the design is to increase the production in the agriculture field by using image processing technique. Databases of all the crops will be saved in the controller. Camera which capture the crops in the field continuously and also gives the information about kind of diseases.LCD interface display the outcome of the pest. Depending upon the kind of diseases, the medicines will supplied automatically. Hence overall productivity growth higher up. The identification of the diseases will be accurate. Therefore, the work of the farmer will be ease.

7. Future Scope

In this project, it is concentrated mainly on the types of rice diseases. The future scope can be applied to other crops with little modifications.

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