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Identification of Agricultural Diseases in Crop Management System Using Image Processing

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ABSTRACT: Detection of pests in the paddy fields is a major challenge in the field of agriculture. The effective measures have to be developed to fight the infestation while minimizing the use of pesticides. Monitoring of pests infestation relies on manpower, however automatic monitoring has been advancing in order to minimize human efforts and errors. This study extends the implementation of different image processing techniques to detect and extract insect pests by establishing an automated detection and extraction system for estimating pest densities in paddy fields. And then, the result obtained from the Matlab is given to the controller. Depending upon the affected percentage, pesticide will be provided to the crop. Experiment results shows that the proposed system provides a simple, efficient and fast solution in detecting pests in the rice fields.

KEYWORDS: Agriculture, pest infestation, image processing and pesticide

I. INTRODUCTION

Rice is the most important and a primary source of food in Asia especially in the India. However, rice may lose its quantity and quality when rice is attacked by different insect pests. Therefore, it is a top priority to find effective methods to reduce the level of their infestation in the paddy fields. In agriculture, pest control has always been considered as the most challenging task for farmers. Most of the farmers used the traditional pest management methods which is the regular spray program based on schedules rather than the presence of insect pests on the paddy fields. These chemicals kill useful insects which eradicate pests in crops. Assessing the density of the rice pest population in paddy fields is very important for pest forecasting decisions. Sticky traps are widely used to trap the insect pests. The trapped insects are brought to the laboratory for counting and identify manually. Usually, crop technicians identify and segregate the insects manually according to their species and count the major pests separately. The resulting counts are used to estimate the pest density in the paddy fields. However, multiple site and frequent counting of rice pests is time consuming and tedious for a crop technician. This can lead to low count accuracy and delays in obtaining accurate counts that can lead to poor decisions on rice pest management. Due to the rapid development of digital technology, there is an opportunity for image processing technology to be used in the field of agricultural research which could help the researcher to solve a complex problem. Image analysis provides a realistic opportunity for the automation of insect pest detection. This study extends the implementation of image processing techniques to estimate pest densities in rice fields by establishing an automated detection system. Through this system, crop technicians can easily count the pests from the collected specimens, and right pests' management can be applied to increase both the quantity and quality of rice production. Using the automated system, crop technicians can make the monitoring process easier. Rice infestation may be easily detected and monitored with the use of a camera.

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II. LITERATURE REVIEW

[1] Explains about sampling techniques and devices for pest management decision making; the light trap, that involves varying size sample which is good for comparing seasonal and yearly catches of insects, but catches are subject to changes in insect behavior and do not catch none flying insects, the sweep net (catching insect using fishnet), is a fast method, very economical, and good for sampling arthropods staying in canopy of rice, but it has human error due to variability and poor catch of arthropods at the base of the plant; tapping the rice, this is a sampling method that utilize a collecting pan with soap solution or oil with water to collect arthropods at the base and stem of the rice. After tapping, arthropods are identified and counted immediately in the field, the visual counting and data recording can be done on field but also subject to human error and very costly in labor, sticky trap is also economical, it measures insect movement and colonization but does not catch non flying insect; yellow pan trap is also economical; it measures insect migration, easy sorting and counting of samples, but the attraction is due to color stimulus and does not catch none flying insects.[2] Describes Image processing is the analysis and manipulation of graphical images from sources such as photographs and videos. There are three main steps in image processing; first is the conversion of captured images into binary values that a computer can process; second, is the image enhancement and data compression; and the third is the output step that consists of the display or printing of the processed image. Image processing is used in such applications as satellite weather mapping, machine vision, and computer-based pattern recognition.. for Electromyography signal used white gaussian noise to represent interference. Two novel mean and median frequencies were presented for robust feature extraction [3] Several attempts have been made to build automatic insect identification systems based on image analysis. The study conducted by Samantha and Ghosh is concentrated to eight major insect pests based on the records of tea gardens of North Bengal Districts of India. The authors apply correlation based feature selection for the feature extraction and reduction, and incremental back propagation neural network as the neural network algorithm used for classifications. Do, Harp and Norris designed a computerized pattern recognition system for non-specialist in recognizing arachids and other arthropods to make the specimen identification easier and accurate. The researchers promote early insect pest detection in greenhouse crops in order to reduce pesticide use. The target application of this system is the detection of pests on plant organs such as leaves. The goal of their work is to define an innovative decision support system for in situ early pest detection based on video analysis and scene interpretation from multi-camera data. In this research, they used apriori
algorithm to detect white flies and aphids, and follow a eneric approach to design a system that can easily adapt different categories of bioagressors. Al-Saqer developed a neural network-based identification system for pecan weevils. used image descriptors as input in the neural network to recognize the pecan weevil. The authors collected different images of pecan weevil and other insects found in the paddy fields. After collecting the images they converted them into binary and re-sized to 114×134 pixels. To process the data, they used different image processing techniques such as Regional Properties and Zernike Moments.

III. SYSTEM ARCHITECTURE

An embedded system is a special - purpose computer system designed to perform one or a few dedicated functions, often with real-time computing constraints. By using this different Image processing techniques we detect and extract insect pests by establishing an automated detection. The result obtained from the Matlab is given to the controller. Depending upon the affected percentage, pesticide will be provided to the crop. It provide better result too.

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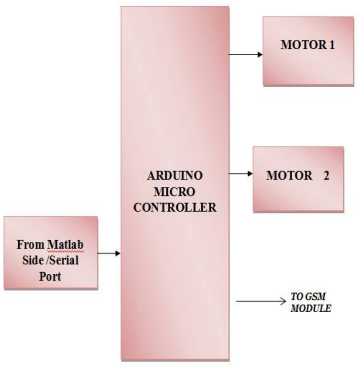
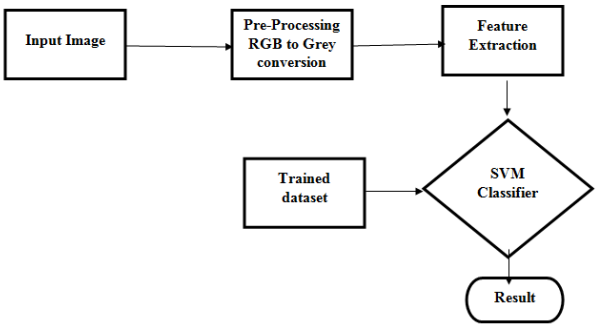


Figure.4.1 Block diagram of the system



4.2. Flow diagram for Crop disease identification

A. ARDUINO CONTROLLER:

In our system Arduino Uno Board is used. The microcontroller is connected with all other hardware units in the module. This is connected with the all components in the circuit. The main operation of the controller is receive the input and send signal to the fingerprint sensor to verify authentication. When the authentication is successful it sends signal to the lcd display to the gsm module and the power supply to the motor.

B. MATLAB

MATLAB is widely used in all areas of applied mathematics, in education and research at universities, and in the industry. MATLAB stands for Matrix Laboratory and the software is built up around vectors and matrices. This makes the software particularly useful for linear algebra but MATLAB is also a great tool for solving algebraic and differential equations and for numerical integration. MATLAB has powerful graphic tools and can produce nice pictures in both 2D and 3D. It is also a programming language, and is one of the easiest programming languages for writing mathematical programs. MATLAB also has some tool boxes useful for signal processing, image processing, optimization, etc..

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C. MOTOR:

When magnetic field and electric field interact they produce a mechanical A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homo polar motor (which is uncommon), and the ball bearing motor, which is (so far) a novelty.
By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source—so they are not purely DC machines in a strict sense.

D. GSM MODULE:

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. The working of GSM modem is based on commands, the commands always start with AT (which means attention) and finish with a <CR> character.

IV.HARDWARE SETUP

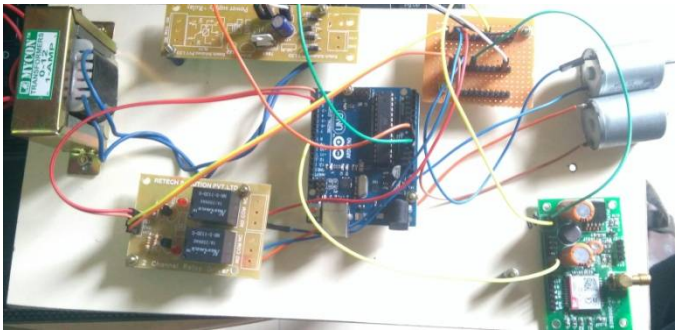

FIGURE 4.3

The software implementation used is the Arduino IDE programming and the embedded c language. With the help of ARDUINO software and the main operation is programmed and the serial input is given to the circuit. This circuit includes authentication, motor ,gsm messaging, DC voltage source,

A DC voltage source of 5V and 12V is given as an input to the circuit. The components are assigned with certain programs and controller also fed with the programs. GSM module is used for sent message to mobiles.

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V.EXPERIMENTAL RESULT AND DISCUSSION

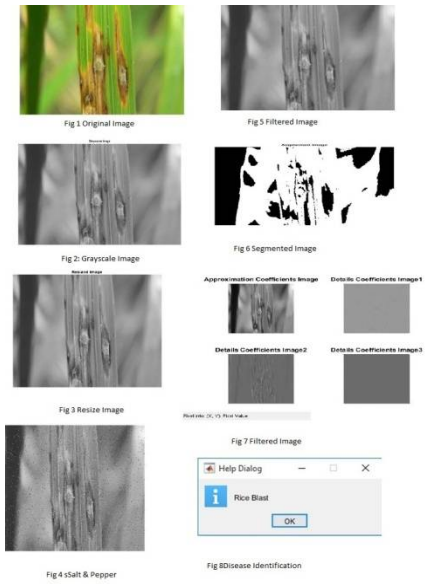

FIGURE 4.4 AFFECTED SAMPLE OUTPUT

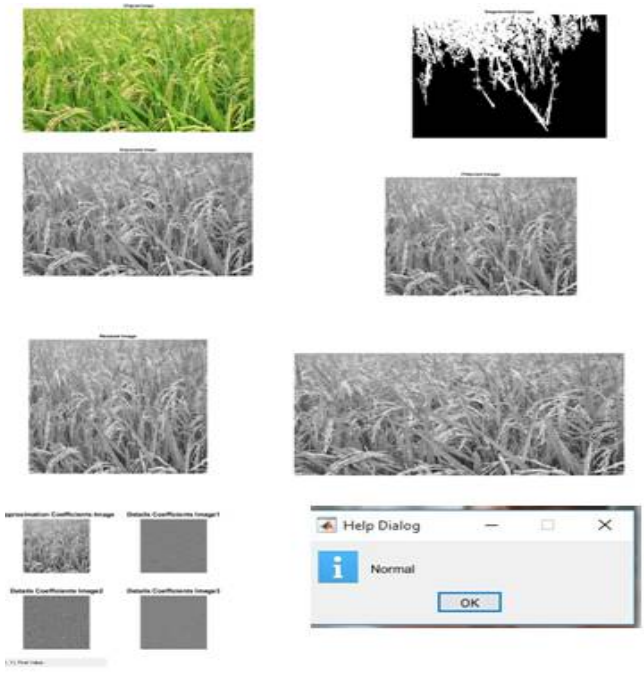

FIGURE 4.5 NON AFFECTED SAMPLE OUTPUT

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From Fig 4.4 and 4.5, the input image that is fetched is obtained as grey scale image. Then the image is resized and by Applying median filter the filtered image is acquired then image is segmented and by implementing HAAR WAVELET transform feature selection is done. Finally the identification of disease has been done.

VI. CONCLUSION

The proposed method explains how embedded system can be applied agriculture and help farmers to improve their crop yield. A reference model is described to implement the proposed solution. Our future work includes implementing the scheme using appropriate IoT devices, hardware and cloud. It is also planned to develop a mobile app to convey the information about the disease to the farmers, in their local languages. This system will benefit the farmers to increase their profit and improve their living condition.

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