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Pest Imaging using IoT

Vanila.S[1], Akash Kumar.H[2], Balaganesan.M[3], Megavarshitha.P.V[4], Menaga.A[5]
Department of Electronics and Instrumentation Engineering
Valliammai Engineering College, Kattankulathur, Chennai, India

Abstract:
India is a cultivated country and about 70% of the population depends on agriculture. Farmers have large range of diversity for selecting various suitable crops and finding the suitable pesticides for plant. Disease on plant leads to the significant reduction in both the quality and quantity of agricultural products. The studies of plant disease refer to the studies of visually observable patterns on the plants. The plant leaf for the detection of disease is considered which shows the disease symptoms. Then depending upon the diseases, the respective medicine can be given to the crops through a automated prototype.

Keywords: -Embedded System, ESP Wi-Fi Module, Image Processing, Pest Detection, Pesticide, PIR Sensor, Thermal Sensing

I. INTRODUCTION

One of the major problems faced in the field of agriculture is pest detection. The infestation of pests must be monitored, remedially powered and minimally reduced. Generally, pest monitoring involves man power. However, enhanced techniques such as automation, Internet of things (IoT) and thermal sensing have been implemented in order to reduce human effort. By establishing these techniques, the pest densities in the agricultural fields affecting the plants are brought through a simple and more efficient solution in detecting pests and getting control of them. A realistic solution to the detection of pests in the agricultural field is brought through by image processing. Furthermore, using an automated system makes the process easier. The Internet of things (IoT) helps the farmer and his land stay connected anywhere, anytime IoT helps in enhancing the productivity in the field of agriculture, and reduce the costs as well. One of the non-destructive methods, the thermal sensing, acquires thermal images using the PIR sensor, to bring about the detection of any threats caused by animals in the field, to the farmers notice. Due to its simple operations and reduced cost, the thermal sensing procedures are gaining increasing popularity among the farmers.

II. LITERATURE SURVEY

Title: A semi-automatic method for the discrimination of diseased regions in detached leaf images using Fuzzy c-means clustering
Author: Joanna Sekulska-Nalewajko1, Jaroslaw Goclawski
This paper describes the segmentation method of stained leaf images for the purpose of the detection of leaf regions with anti-pathogen reaction colour products. The segmentation consist in the image conversion to HSV colour space and fuzzy c-means clustering in hue-saturation space to distinguish severalpixels classes.
Disadvantage: It does not classify the type of disease affected.

Title: Detection and Classification of Plant Diseases
Author: Mr. N.S. Bharti, Prof. R.M. Mulajkar
They proposed software solution for automatic classification and detection of plant leaf diseases. Which is an improvement to the solution proposed in the previous one, as it will be able to provide quick and more accurate solution. The process consists of four main phases as mentioned in previous one. The following extra two steps are required to add successively after the segmentation phase.

Title: Classification of Cotton Leaf Spot Diseases Using Image Processing Edge Detection Techniques
Author: P.Revathi and M.Hemalatha
They proposed software solution for automatic classification and detection of plant leaf diseases. Which is an improvement to the solution proposed in the previous one, as it will be able to provide quick and more accurate solution. The process consists of four main phases as mentioned in previous one. The following extra two steps are required to add successively after the segmentation phase.

Title: Infected Leaf Analysis and Comparison by Otsu Threshold and k-Means Clustering
Author: Mrunalini R. Badnakhe,Prashant R. Deshmukh Leaf diseases are identified with help of the feature extracted by the machine learning approach. Image feature extraction is an important part of the paper .The extracted feature will going to help to find out the diseases. So through this research we can directly help the farmer. By using the automated agricultural inspection, farmers are benefited.

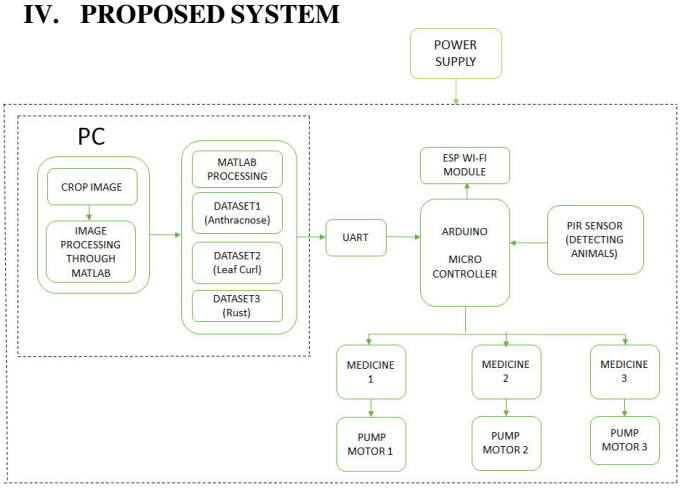
Title: Automatic Detection and Classification of Plant Disease through Image Processing
Author: Mr. Pramod S. landge, Sushil A. Patil, Dhanashree S. Khot, Omkar D. Otari, Utkarsha G. Malavkar They propose and experimentally evaluate a software solution for automatic detection and classification of plant diseases through Image Processing. Farmers in rural India have minimal access to agricultural experts, who can inspect crop images and render advice. Delayed expert responses to queries often reach farmers too late.

III. EXISTING SYSTEM

Title: Pest detection and extraction using Image Processing technique
Abstract: It is a challenge to detect pest in paddy field, effective methods were developed to reduce the use of pesticides. This technique leads to better pest management and production. Monitoring of pest is done using manpower, which does not give a accurate result**.** However, automatic pest

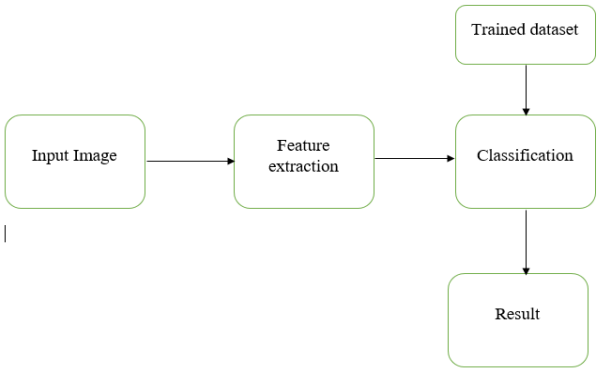
detection reduces human error and efforts. The different image processing techniques are involved to detect and manage pests by automatic pest detection and extraction method. This system gives an easy and fast results in pest detection in the rice fields.

IV. PROPOSED SYSTEM



In our proposed system, first the input image is selected for image processing through MATLAB. The dataset contains the different types of diseases affected by the that particular crop. This is connected to the Arduino using UART. The Arduino is connected to the ESP Wi-fi module, where the crop is monitored. An PIR sensor is used for the detection of animals, insects, and human. It sends an input signal to the Arduino. According to the infected level, Arduino controller receives some characters in serial. According to the character received the particular motor will be turned on. It also classifies the type of disease the crop is affected.

IMAGE PROCESSING:



The input image is selected for image processing. Feature extraction of the image is done. The features of the image are mean, standard deviation, variance, skewness, entropy. The trained dataset contains data for various diseases. The input image and the dataset images are compared by using the features extraction technique. It identifies the type of disease affected by the crop and the input is sent to the Arduino controller.

REQUIREMENTS:

The hardware requirements are listed below:

- Arduino controller(AT mega 328)
- UART RS232 CABLE
- Power supply unit(5V DC)
- Relay
- Pump motor(DC Motor)
- PIR sensor
- PC

Similarly, the software requirements are listed as follows

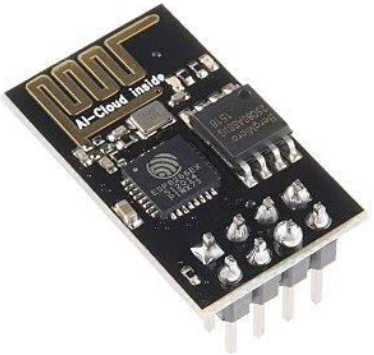
- MATLAB software
- Embedded c programming
- HTML

V. HARDWARE DESCRIPTION

Arduino controller: Arduino Uno is the latest form of Arduino boards. It has 14 digital input and output pins, 6 analog input pins, a power jack, a usb connection. Arduino Uno can be powered by external power supply or used connection. It has 32KB of flash memory and also includes 2KB of SRAM and 1KB of EEPROM. Arduino Uno provides UART serial communication.

PIR sensor: A device used to detect motion by receiving infrared radiation.When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors.When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. It detects a rapid change of infrared energy and sends a signal to the Arduino.

ESP 8266: The ESP 8266 is capable of either hosting an application or offloading all Wi-fi network functions. It is a very economic Wi-fi module and that makes it an ideal module for internet of things. The module has low power 32 bit processor which can be used for custom firm wares means it can host small WebPages.



UART: A Universal Asynchronous Receiver-Transmitter is a computer hardware device for asynchronous serial communication in which the data format and transmission speeds are configurable. The electric signaling levels and

methods are handled by a driver circuit external to the UART. A UART is usually an individual integrated circuit used for serial communications over a computer or peripheral device serial port. One or more UART peripherals are commonly integrated in microcontroller chips.

VI. METHODOLOGY

There are totally 3 sections in our proposed system:

1. Image processing
2. Controlling section
3. Monitoring section

IMAGE PROCESSING:

1. The affected image is taken for image processing.
2. It is converted into grey scale image. An image is an array or a matrix of square pixels (picture elements) arranged in columns and rows.
3. Image processing is a subset of the electroic domain where in the image is converted to a array of small integers, called pixel.
4. Each pixel is converted into black, white and grey. Black is coded as '1', white is coded as'0', grey is coded according to the transition value.
5. Now, the image is digitized. It identifies which portion is affected.
6. The image is segmented and filtered.

CONTROLLING SECTION:

1. It sends some characters in serial through UART to the Arduino.
2. Each pump is filled with the medicine for the different diseases.
3. Relay is connected to the pump motors. According to the information received, the controller sends a signal to the relay module.
4. It turns on the corresponding pump for the disease detected.

MONITORING SECTION:

1. PIR Sensor is used to detect the animals or insects entering the field.
2. If it senses a warm body, it sends an alert message to the webpage using IoT.
3. Thermal imaging information is sent using the ESP 8266.
4. This can be done without going in contact to the field. Since, everything is automated.

VII. CONCLUSION

- The project proposes an idea for pest detection.
- The PIR sensor helps to detect any warm bodies entering into the field. It prevents from plant getting infected.
- Detection and identification of plant diseases and supply of respective medicines.
- Thus it helps to reduce the manpower and gives accurate results.

VIII.REFERENCE

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