CLOUD BASED AUTONOMOUS PLANT DISEASE IDENTIFICATION

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ABSTRACT:

In agricultural fields plant monitoring is one of the complicated task. The need of invention of various electronic devices for plant disease monitoring is also much more important. Our proposed method involves detection of various diseases in plants and relieves them from those diseases with suitable precautions. In this work Raspberry pi plays a major role in monitoring of plant. A camera which takes snap of all the plants are connected to Raspberry pi module and all details of the plants are stored as a database. The stored information will include name of the plant, type of disease affected by that plant and image of that plant. A bot is used for capturing images of different plants and helps in avoiding spreading of disease. All the collected information is stored in the website with cloud storage so that the information can be retrieved whenever necessary to control the diseases. This work will be more efficient in terms of time and finding several entities when compared to existing system.

Index Terms – disease recognition, Raspberry pi, plant detection and medicinal spray.

I.INTRODUCTION

The term agriculture is the cultivation of raw food products for the human beings to survive in this world. The practice of agriculture mark its role before thousands of years. Since its origin, development in this field till date is driven by various technology practices. Agriculture provides employment for one-third of the man force globally. In these due to various technological transformations developed countries are using various automation tools reducing the human labour, but the developing countries are facing some difficultly in the area of farming. India stands 8th in terms of land area under agriculture, but it stands 84th in kilogram yield per hectare. This despite the fact that more than 50% of the workforce in the country is involved in agriculture. This condition occurs due to unfit agricultural practices and poor quality of soil, lack of awareness and knowledge of modern agricultural farming methods and technology. Now the modern farmers lack in identifying how the various environment parameters like humidity and temperature affect their crop. Though the rapid spread of mobile connectivity and mobile internet in the country, efficient and cheap methods to exploit the same to increase efficiency and productivity remain out of reach. The area which attracts the recent time researchers is the analysis of different types of plant diseases by finding solution and promotes yielding. An automated system must be introduced to avoid disease in plant and monitor on daily basis.

II. LITERATURE SURVEY

P. R. Rothe and R. V. Kshirsagar proposed an Active Contour model (Snake segmentation) technique for segmenting the diseased region from the cotton leaf. Hu's moments are used as the features for the classification. For training and classification, it uses a set of seven moments and Back Propagation Neural network has been used for classification with an accuracy of 85.52%. Back propagation neural networks are highly efficient for solving Multiple Class problems. Its weight is updated using Levenberg Marquardt Optimization. The proposed methods can be applied to other crops like orange, citrus, wheat, corn and maize etc. Aakanksha Rastogi, Ritika Arora and Shanu Sharma suggested a Fuzzy system for leaf disease detection and grading.K-means clustering technique has been used for segmentation. which groups similar pixels of an image. RGB color space is converted to L*a*b space, where L is the luminosity and a*b are the color space. The reason for this conversion is that luminosity factor is not important for the color image. GLCM matrix including contrast, correlation, energy and homogeneity has been measured for disease grading. Artificial Neural Networks as been used for training the data. Fuzzy logic is used for grading the disease. Smita Nakwadi and Niket Amoda recommended a k-means clustering technique for segmentation. RGB has been converted to HIS, where H is the hue, I indicate the intensity and S indicate the saturation value. Colour Co-occurrence method or CCM method has been used for color feature extraction. Plant disease is detected using Histogram matching. The Threshold value for the pixel is computed using Otsu's method. S. S. Sannakki and V. S. Rajpurohit suggested a Back-propagation Neural Network based classifier (BPNN) for detecting the disease in Pomegranate leaf. Features have been selected as colour and texture. BPNN detects and classifies the diseases with a precision of around 97.30 %. Dr. K. Thangadurai and K. Padmavathi recommended computer vision image enhancement for leaf disease identification. It includes colour conversion and Histogram equalization. Histogram equalization increases the image clarity. RGB to Grayscale conversion is used to retain the luminance information rather than Hue and Saturation information. For encoding of linear intensity values, Gamma expansions are used. Cumulative Gaussian distribution function distributes the intensity value of the image. Histogram Equalization provides the better quality image in Grayscale. YuanTian, ChunjiangZhao, ShenglianLu and XinyuGuo proposed an SVM-based Multiple Classifier System (MCS) for wheat leaf diseases. It uses a stacked generalization structure to join the classification decisions obtained from three kinds of support vector machines (SVM) based classifiers. The features like colour, texture and shape features are used as training sets for classifiers. Firstly, features are classified using a classifier in low-level of MCS to corresponding mid-level categories, which can partially detect the symptom of crop diseases according to the knowledge of plant pathology. Then the mid-level features are generated from these mid-categories generated from low-level classifiers. Finally, high-level SVM has been trained and correct errors made by the colour, texture and shape SVM to improve the performance of detection. Compared with other classifiers, it can provide better success rate of detection. The classifiers like SVM Artificial Neural Network classifier, k-nearest neighbour (kNN) classifier's, the MCS can obtain better recognition accuracy than others classifiers. Colour, texture and shape SVMs to improve the performance of detection. Compared with other classifiers, it can provide better success rate of detection. The classifiers like SVM, Artificial Neural Network classifier, k-nearest neighbour (kNN) classifier's, the MCS can obtain better recognition accuracy than others classifiers.

III. PROPOSED SYSTEM

The proposed system uses two phases. The first phase is to detect the plant from the real time environment and followed by disease detection in plants. The first phase is completed taking plant images by using Camera which is connected to Raspberry pi. These images of the plants are used for disease detection. Then the detected disease is compared with the stored data of every stuff. The database is collected and stored into the pi at the initial stage. The database consists of name, images and their disease name. The camera is kept such a way that it covers entire plant. The camera with raspberry pi is placed over bot to monitor various plant samples and provide proper medicine for cure. The bot monitors by daily basis and creates a collection of database which can be viewed by the website. Thus with the help of this system, time will be saved and it is so convenient to record the different data of plant. We can monitor plant on any time without any human intervention.

Advantages of proposed method:

- Easiest method to keep track of disease spreading.
- Provides accurate data by daily analysis.
- Medicine for disease is sorted out and Amount of medicine usage is reduced.
- There is no physical interaction with the system.

IV. SYSTEM ARCHITECTURE

From the **figure 1** power supply is given to the raspberry Pi which is the heart of the proposed system Pi camera is connected to the raspberry pi camera slot. Camera captures the frame of images of the plant. Raspberry pi takes those images as input images and compares the input images with the existing images. This happens due to importing the OpenCV packages at the initial stage of the development of the system. The result is stored in updated in the website.

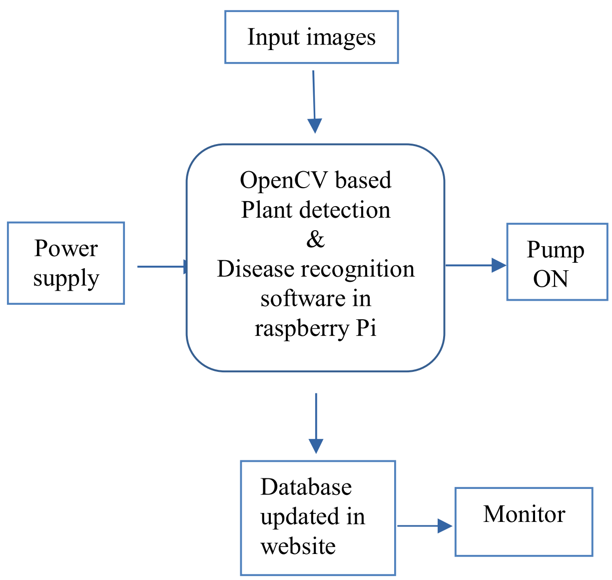


Figure 1: Architectural outline of proposed method

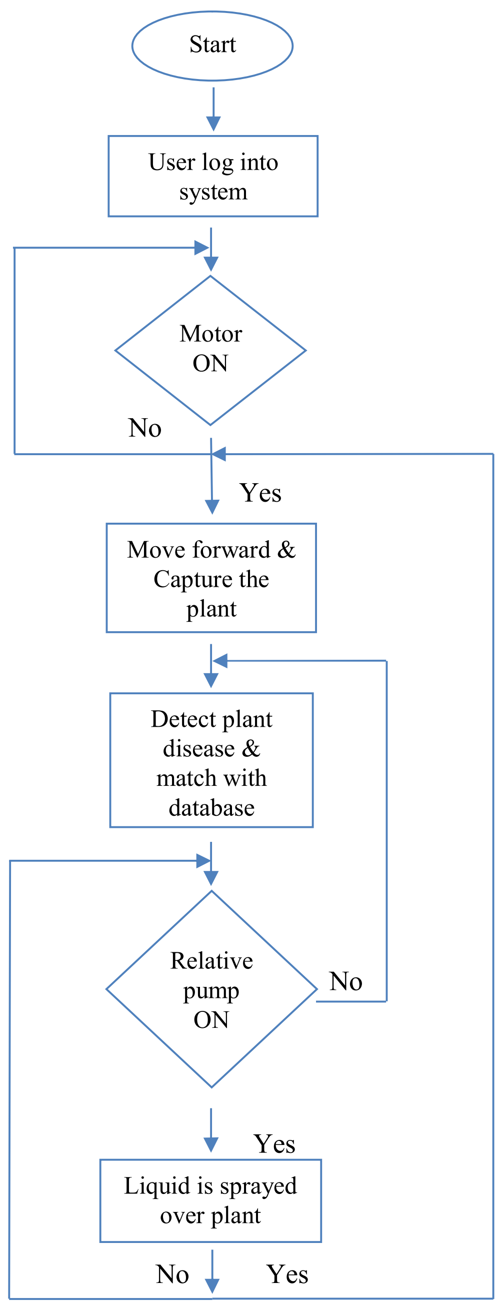
V. ALGORITHM

STEP 1: Write Raspbian OS on to the SD card and fix the card into the SD slot
STEP 2: Install all the open CV libraries into the raspberry pi
STEP 3: Fix the entire hardware setup
STEP 4: Enroll the images of the plant in different dimensions
STEP 5: Store the images into the file system

STEP 6: Train the raspberry pi for disease recognition
STEP 7: Run the disease recognition program
STEP 8: Switch the pump ON, when disease is found
STEP 9: Status is updated and monitored through website.

VI. FLOW CHART

Camera detect and captures the image of the plant, it resizes the captured image up to certain point. The segmented image is compared with the present data sets and diseases are recognized.



VII. SYSTEM IMPLEMENTATION

The proposed system has been implemented with the help of three basic platforms:

- On field platform
- Cloud platform
- User platform

These three platforms are core of this project which helps to understand transformations between each stage. The Onfield platform consists of major hardware components which records details about plant. The cloud platform collects database from On field platform and stores in it. The user platforms are used to monitor the records.

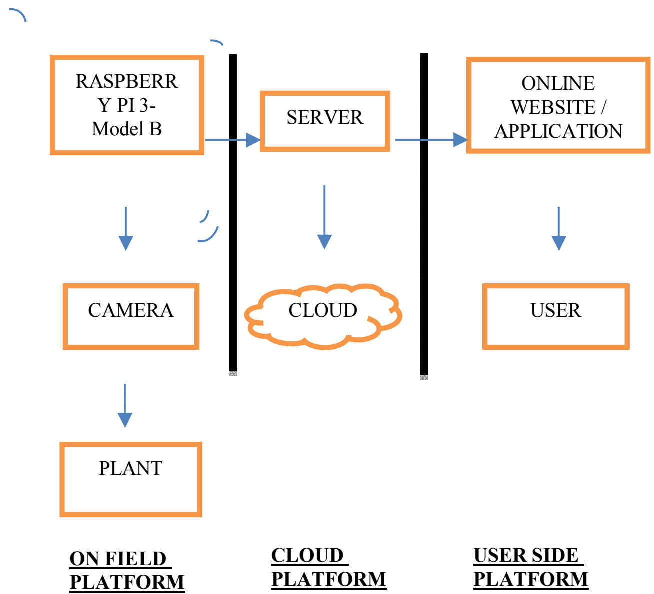


Figure 2: System implementation platform

VIII. EXPERIMENT

The experiments process is listed below:

1. Plant Detection:

Start capturing images through raspberry pi camera of the client side:

Begin:

//Pre-process the captured image and extract plant image

//calculate the eigen value of the captured plant image and compared with eigen values of existing plants in the database.

//If eigen value does not matched with existing ones, save the new plant image information to the plant database (xml file).

//If eigen value matched with existing one then recognition

step will be continued.

End;

2. Disease Recognition:

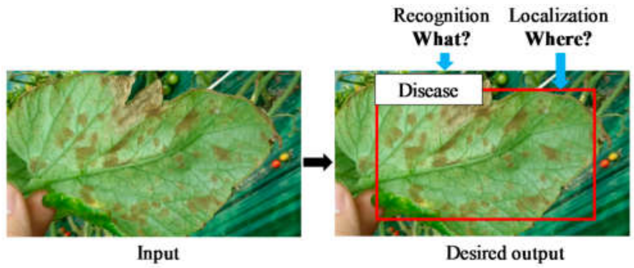


Figure 3: Disease recognition

Using PCA algorithm the following steps will be followed in for plant recognition.

Begin:

// Find the disease information of matched plant image in the database.

// Update the website with corresponding plant image, name of plant disease and system time.

//The experiment is continued with medicinal spray for treatment of disease.

End;

3. Medicine Spray:

Begin:

// If the disease plant image is found, the corresponding pump is ON and the medicine is spayed over plant.

// Update the status in the website with corresponding plant image and system time.

End;

IX. CONCLUSION

The device can also be designed to monitor particular disease which is mainly used for agricultural purposes. The system takes report of each plant by continuous observation on daily basis. The result of our preliminary experiment shows improved performance in the estimation of type of diseases in each plant. The bot is additionally added to monitor various plants and avoids disease spreading. Current work is focused on the disease detection algorithms from images or video frames.

In further work, authors intend to improve disease recognition effectiveness by using the interaction among our system. On the other hand, our system can be used in a completely new dimension of disease recognition application, mobile based disease recognition, which can be an aid for common people to know about any disease being photographed by cell phone camera. Our device can also be implemented in quadcopter, where humans can't enter into their field and it also protects their skin from disease.

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