DEVELOPMENT OF A SYSTEM FOR ESTIMATION OF NPK AND PH IN SOIL AND DISEASE DETECTION IN SOIL AND LEAVES

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ABSTRACT

Agriculture is the backbone of India. Most of the scientists are doing research to increase the cultivation of crops. But one problem still exist which is a major concern of the cultivation of crop and that is crop pests. Due to these problems, the cultivation decreases and hence all the farmers and in turn the country suffers from lack of cultivation of crop. Different types of pesticides are there in market which are used to avoid the damage to fruit and vegetable, but the amount of pesticides to be used is not known due to which the cost as well as the environmental pollution gets affected. A strong demand now exists in many countries for non-chemical control methods for pests or diseases. Greenhouses are considered as biophysical systems with inputs, outputs and control process loops. Most of these control loops are automatized (e.g., climate and fertirrigation control). However, no automatic methods are available which precisely and periodically detect the pests on plants. In fact, in production conditions, periodically observes plants and search for pests. This manual method is too time consuming. Diagnosis is a most difficult task to perform manually as it is a function of a number of parameters such as environment, nutrient, organism etc. With the recent advancement in image processing and pattern recognition techniques, it is possible to develop an autonomous system for pest classification. Early detection of pest or the initial presence of a bioagressor is a key-point for crop management. Hence Automatic detection is very much important for early detection of pests.

Keyword: - *Cultivation, Pests, Pesticides and Bioagressor*.

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1. INTRODUCTION

Agriculture is the basis of livelihood for the farmers through the production of food and important raw materials. Agriculture faces various challenges, hence becoming harder to attain its primary objective of feeding the growing population every year. The bulk of the Indian farmers live in rural areas and the decay in agriculture growth has affected their financial condition adversely. Long lasting solutions would require rethinking of rural development by technology penetration and taking agricultural practices towards structural transformations that embodies the smarter methods and profits the farmers. Traditional agricultural methods employed by the local people are highly sustainable, although the all-inclusive cost is not cheap. Our research goal is to provide long term. Sustainable solution for automation of agriculture**.** In India 30% of crops are wasted/demolished because of pest diseases. Monitoring of agriculture process is entirely manual which may lead to some improper management in turn leads to reduction in yield. Detection of crop diseases in later stages when crop is about to harvest.

Traditionally, farmers apply a consistent amount of fertilizer at a constant rate across the entire field. The rate at which fertilizer is applied is usually based on grid soil sampling or previous year's yield maps. Factors such as moisture and temperature, which can cause leaching or de-nitrification, are often not taken into account when calculating this year's fertilizer application rate. Hence this project proposes a system which combines all the factors

like nutrient requirement monitoring, moisture content monitoring and early crop disease detection methods which can be alerted to farmers for the necessary actions.

1.1 Technical Background

The study of soil and leaves disease refers to the studies of visually observable patterns of particular leaf and soil. Now-a-days crop face many diseases. This paper provides a method to detect disease by calculating leaf area through pixel number statistics. The method studied is for increasing throughput and reducing subjectiveness arising from human experts in detecting the leaf and soil diseases. Leaf spots can be indicative of crop disease are subjected to expert opinion. In this paper, an Image Processing system is developing to automative inspection of these leaf spots. MATLAB processing is a semi-automatic tool to calculate leaf and soil area for more users easily.

2. DESIGN AND IMPLEMENTATION

The figure 2.1 shows the block diagram of the proposed system. The system consists of two sections, Transmitter and Receiver. In the transmitter section, diseased images of soil and leaves are collected and they are processed using image processing. The image processing unit depicts the different pH levels associated with different color patterns and the levels of macronutrients N, P, K in the soil sample and values of images. In the receiver section, the information from the IP unit is passed to the controller which is interfaced with LCD for displaying the pH levels, moisture level and the quantified value of the important macronutrients present in the soil. Farmer will also get message that which disease has come and fertilizer has to be used and farmer will fill the tanker with the fertilizer. Robot will put the fertilizer by mixing required amount of NPK concentration. After taking all these remedies leaves may get disease so we go for disease detection in leaf. Again, the information is processed though the IP unit feeding the identified information to the controller, which is then displayed in the LCD regarding the disease present and its phase. All the identified data and the suitable actions need to be taken is sent as alert to Robot and the farmer's smartphone for necessary response. Farmer will also get which pesticide has to be used. Farmer will fill the tank with pesticide and Robot will sprinkle to all plants. This helps the farmer to get more yield, farmer will not be exposed to any type of diseases. Manually if we try to do, this takes more time so there by we are reducing time consumption.

2.1 SYSTEM DESIGN

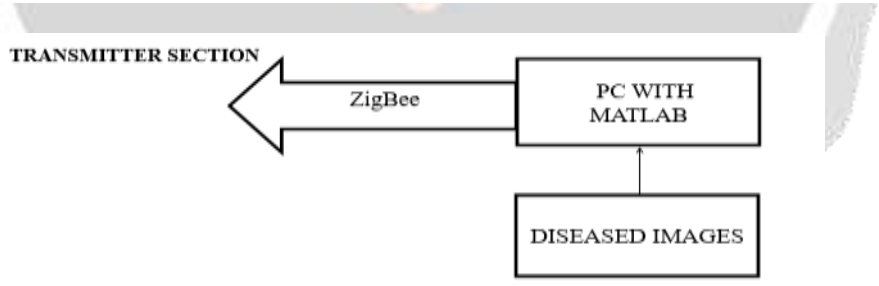
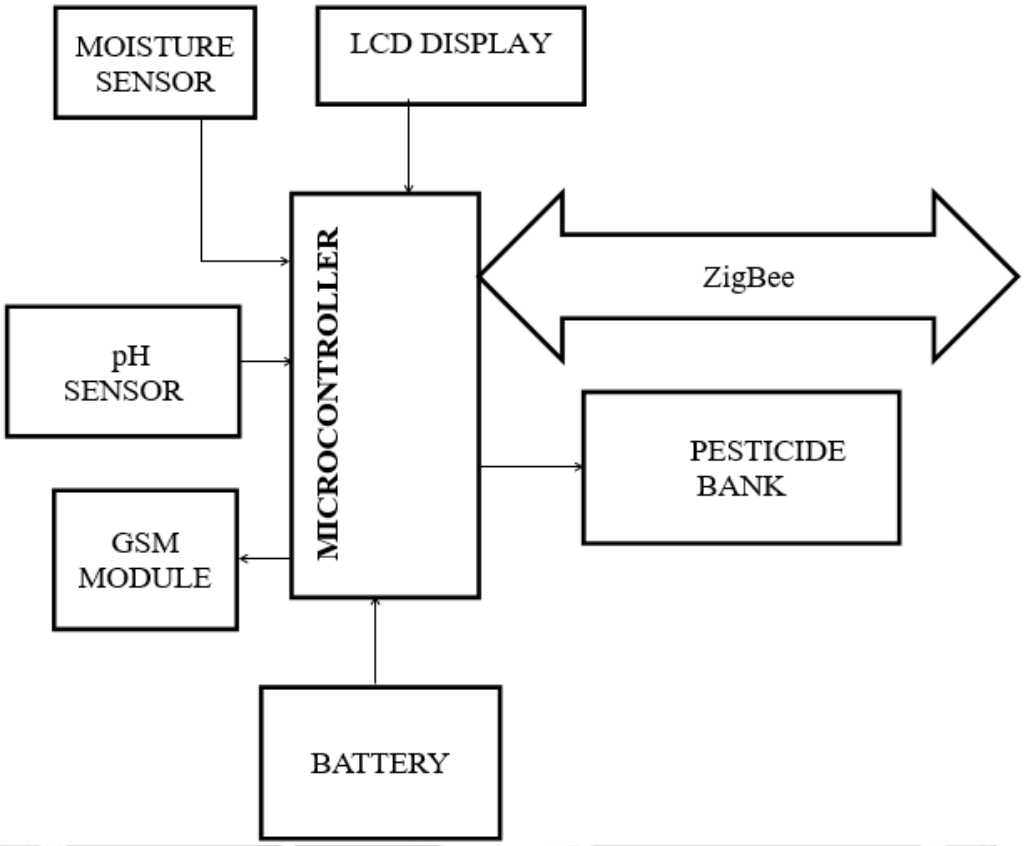


Fig-2.1: System Design



(b)

Fig-2.2: (a) & (b) Proposed Block diagram

2.2 Experimental Result

Classification involves two stages, training and testing using SVM classifier. In training phase, classifier is trained using feature values and its respective target values. This trained classifier is then used to classify test images.

First step is thresholding and filtering. Fig. 2.2(a) shows original image and Fig.2.2(b) shows filtered image and Fig.2.2(c) shows gray scale image.

(a) (b) (c)

Fig 2.2: (a) Original Image (b) Filtered Image (c) Gray scale image

From the filtered image we observed that noise is removed and the quality of the image is improved.Then filtered image is segmented into 3 clusters using K-means clustering. Fig. 2.3 shows 3 clusters formed using K-means clustering.

The table 2.1 shows feature extraction of image. Here we have extracted 12 features of image.

Table -2.1: Features of images

Features	Values
Contrast	0.6755
Correlation	0.8705
Energy	0.0698
Entropy	7.4942
Homogeneity	0.7837
IDM	255
Kurtosis	2.1876
Mean	127.5865
RMS	15.9645
Skewness	0.1983
Smoothness	1.0000
Standard_Deviation	46.1392

Fig -2.3: Segmentation using K-means Clustering.

In all these clusters, the diseased part of the image is highlighted so that we can easily determine the disease present in the particular leaf. Segmentataion is important step where we are going to detect the disease and then find the solution for the particular diseases that we have found.

Soil images are also processed using MATLAB in order to detect the diseases. Same procedure is applied for soil to detect the diseases. Below fig shows the some of the soil images.

(a) (b)

Fig - 2.4: (a) & (b)Diseased images of soil.

In this method, the soil diseases are detected and the solution for these diseases are found finally we are going to reduce the diseases and in turn we are increasing the yield which helps farmer and also our country economically.

Table - 2.2: Soil NPK and pH values

Soil	Nitrogen(N)	Phosphorus(P)	Potassium(K)	pH value
Powdery Mildew	61	65	59	3.7
Bacterial Wilt	55	60	58	4.6

The table 2.2 shows the NPK and pH values of diseased soil.

3. CONCLUSION

Estimation of NPK and pH in soil. Soil and Leaf disease detection by image segmentation and clustering techniques. Automation of agriculture process that is water sprinkling by using moisture sensors. Quantitative control of pesticides spraying. Features of segmented images are stored in database with respective image of agricultural soil and leaves. Using support vector machine classifier, we would be finding out type of disease presents in image and give remedies to control it.

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