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ENVISION OF CROPS TO PREVENT AND REDUCE THE USAGE OF PESTISIDES AND FERTILIZERS USING RASPBERRY PI & AI

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Abstract: Tree physiology and condition are closely correlated with the immediate environment and therefore is linked to climate effects in that environment. Automatic seed, plant disease identification and recognition tools have proved to be a valuable source of data that assist decision making in farms. Artificial intelligence tools like Deep learning and Convolutional Neural Network (CNN) are gaining popularity in this field as they provide optimum solution for plant disease identification. Earlier, pest detection was done by manual observation. This method is arduous and prone to error. Several plant diseases cannot be recognized by bare human eyes. Because early disease occurrences are minute in nature. At the same time due to fear of attack of pest/disease, farmer uniformly sprays pesticides/fertilizers in whole farm which may lead to damage of soil as well as plants and also infected to humans as well. In order to improve the quality of production and yield in plants, it is essential to identify the symptoms in their initial stages and treat the diseases. The crop stress index is calculated to indicate plant water status using ambient temperature. In the end we are going to implement this process to prevent the human lives from harmful effects caused by pesticides.

I. INTRODUCTION

The accelerated population growth and the continuous shortage of labour in the area of agriculture, are two of the main motivations for the growingly interest in the area of robotics and precision farming. Here, agricultural vehicles play a very important role, and a lot of research activities related to navigation, path planning and control have been increasingly taking place in the past recent years. For instance, presents a new concept with a fleet of small robots providing a solution for soil compaction in a scalable and energy-efficiently manner. In the same line of small vehicles, here we present a controller for a skid-steered robot used for corn seeding tasks.

The production of crops is associate with many factors, for example, climate change, plant diseases, and insect pests. According to recent researches, about half of the crop yield in the world is lost to pest infestations and crop diseases. Crop pests cause significant damage to crops and mainly affect the productivity of crop yield, whether in developing or developed countries. There are too many types of insects and the number of individuals which belongs to the same species is enormous. However, traditional pest identification of insects is typically time-consuming and inefficient. Therefore, in order to improve the efficiency of agricultural production, a new effective recognition method should be proposed.

STEPS OF IMAGE PROCESSING

Image Acquisition

This is the first step or process of the fundamental steps of digital image processing. Image acquisition could be as simple as being given an image that is already in digital form. Generally, the image acquisition stage involves pre-processing, such as scaling ect..

Image Enhancement

Image enhancement is among the simplest and most appealing areas of digital image processing. Basically, the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain features of interest in an image. Such as, changing brightness & contrast etc.

Image Restoration

Image restoration is an area that also deals with improving the appearance of an image. However, unlike enhancement, which is subjective, image restoration is objective, in the sense that restoration techniques tend to be based on mathematical or probabilistic models of image degradation.

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Colour Image Processing

Colour image processing is an area that has been gaining its importance because of the significant increase in the use of digital images over the Internet. This may include colour modelling and processing in a digital domain etc.

Wavelets and Multi-Resolution Processing

Wavelets are the foundation for representing images in various degrees of resolution. Images subdivision successively into smaller regions for data compression and for pyramidal representation.

Compression

Compression deals with techniques for reducing the storage required to save an image or the bandwidth to transmit it. Particularly in the uses of internet it is very much necessary to compress data.

Morphological Processing

Morphological processing deals with tools for extracting image components that are useful in the representation and description of shape.

SEGMENTATION

Segmentation can be classified as follows:

- Region Based
- Edge Based
- Threshold

REAL-TIME MONITORING AND ANALYSIS

One of the most useful tasks drones can take on is remote monitoring and analysis of fields and crops. Imagine the benefits of using a small fleet of drones instead of a team of workers spending hours on their feet or in a vehicle travelling back and forth across the field to visually check crop conditions.

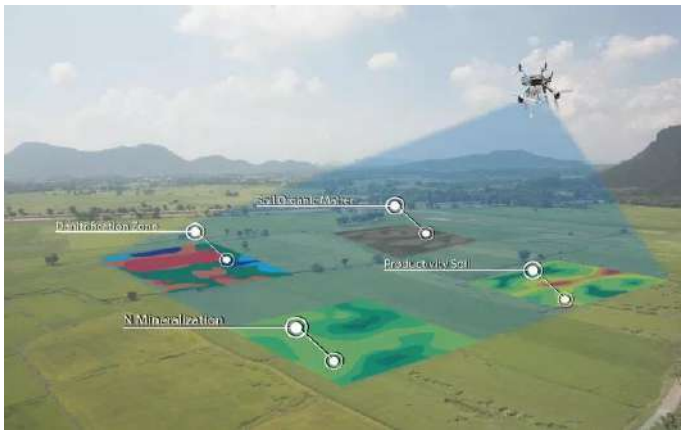

Fig 1 Real Time Monitoring

This is where the connected farm is essential, as all this data needs to be seen to be useful. Farmers can review the data, and only make personal trips out into the fields when there is a specific issue that needs their attention, rather than wasting time and effort by tending to healthy plants.

Our concept is digitalization of agriculture and farming operations so farmers can track crop requirements and predict their development correctly. Surely this idea will speed up their company to achieve new heights and be more lucrative as well. Implementing our project relies mainly on farmers consciousness, which we think will be readily generated owing to its countless

II. LITERATURE REVIEW

1 PREDICTION OF PESTICIDES AND FERTILIZERS USING MACHINE LEARNING AND INTERNET OF THINGS

AUTHOR: Sreenath N YEAR: 2021

According to the Agricultural Census of India, 64.5% of the population is affiliated to agriculture and yields around 16-17% of the country's GDP. Agriculture is the backbone of our country and is yet an extremely ignored sector, with little or no development taking place. For a country ranked as the second highest producer of rice in the world, it is imperative to be the change and focus on how to improve the methods of agriculture to make the lives of the farmers

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easier. The use of modern technology in agriculture is the need of the hour. An important part of agriculture is the use of pesticides and fertilizers. Pesticides and fertilizers help in keeping the crop safe from pests and in providing additional nutrients in order to grow a successful crop.

2 OVERVIEW OF HUMAN HEALTH HAZARDS POSED BY PESTICIDES IN PLANT PRODUCTS
AUTHOR: PetronelaCozma YEAR:2017

Pesticides use, one of the hottest topics nowadays when it comes to human health, started to be a serious concern to consumers considering their known harmful effects. This paper provides a short overview on pesticides application and their corresponding maximum residue levels (MRLs) in plant products, risks associated to human health and steps in conducting a human health risk assessment. This analysis highlights the requisite of continuous monitoring programmes of pesticide residues in plant products, and deep knowledge of their toxic effects and assessment strategies necessary in human health risk estimation and mitigation.

3 BIOPESTICIDES: AN ALTERNATIVE APPROACH AGRICULTURAL OUTPUT (FOOD) AND ENVIRONMENTAL SAFETY
AUTHOR: Grace Cornelius YEAR: 2019

Agriculture contributed the major portion of our economic value, although with the increasing population there is a requirement of highly nutritional, disease preventive and easily cultivated and prepared crops. This direct the farmers for applying conventional pesticides in exceeding amount, also through Biomagnifications pesticides causes many health problems which is responsible for asthma, kidney failure, arthritis,), skin disease, cancer etc. In this domain there is a requirement of a substitutional trend to control crop field insect with negligible harmful effect to non targeted organism, this promoted biopesticides application.

4 SMART CROP PREDICTION USING IOT AND MACHINE LEARNING
AUTHOR: Archana Gupta YEAR:2020

Agriculture is a key economic driver. It is a key to healthy biosphere. People depend on a wide range of agricultural products in almost all aspects of life. Farmers need to cope with climate change, and meet rising demands for more food of higher food quality. IoT based Smart Farming improves the entire Agriculture system by monitoring the field in real-time. It keeps various factors like humidity, temperature, soil etc. under check and gives a crystal clear real-time observation

III. BLOCK DIAGRAM

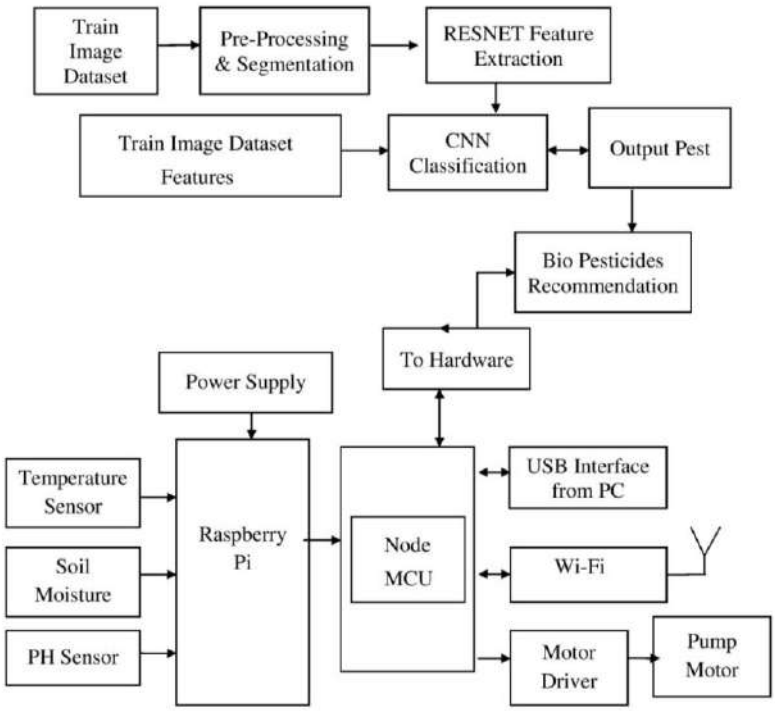

Fig 2 Block diagram of proposed system

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IV. PROPOSED SYSTEM

Even when considering trees only, leaves show an impressively wide variety in shapes. It is however necessary to come up with a representation of what a leaf is, that is accurate enough to be fitted to basically any kind of leaf. The general shape of a leaf is a key component of the process of identifying a leaf. Botanists have a whole set of terms describing either the shape of a simple leaf, of the lobes of a palmate leaf, or of the leaflets of a compound leaf. The problem being that the borders between the different terms are not well defined, since leaves can naturally have non-canonical, intermediate shapes.

The margin of the leaf is also a very important feature to spot. Its shape can be determining when trying to discriminate two species that have more or less the same global shape. It may consist of teeth of various sizes and frequencies, regularly arranged or not, from large spiny points, to small regular saw-like teeth, or even to a smooth entire border.
We present a study on segmentation of leaf images restricted to semi-controlled conditions, in which leaves are photographed against a solid light-colored background. Such images can be used in practice for plant species identification, by analyzing the distinctive shapes of the leaves.

We restrict our attention to segmentation in this semi controlled condition, providing us with a more well-defined problem, which at the same time presents several challenges. The most important of these are: the variety of leaf shapes, inevitable presence of shadows and specularities, and the time constraints required by interactive species identification applications. We evaluate several popular segmentation algorithms on this task.

In everyday more urbanized and artificial world, the knowledge of plants, that used to constitute our most immediate environment, has somehow been lost, except for a handful of specialists. What is allegedly seen as unquestionable progress also scattered away the names and uses of so many trees, flowers and herbs. But nowadays, with a certain resurgence of the idea that plant resources and diversity ought to be treasured, the will to regain some touch with nature feels more and more tangible.

And making it possible, for whoever feels the need, to identify a plant species, to learn its history and properties, is as much a way to transmit a vanished knowledge, as to allow people to get a glance at nature's unfathomable richness. The identification of species is the first and essential key to understand the plant environment. Botanists traditionally rely on the aspect and composition of fruits, flowers and leaves to identify species.

But in the context of a widespread non-specialist-oriented application, the predominant use of leaves, which are possible to find almost all year long, simple to photograph, and easier to analyze from two-dimensional images, is the most sensible and widely used approach in image processing. In the process of tree identification from pictures of leaves in a natural background, retrieving an accurate contour is a challenging and crucial issue. In this paper we introduce a method designed to deal with the obstacles raised by such complex images, for simple and lobed tree leaves.

A first segmentation step based on a light polygonal leaf model is first performed, and later used to guide the evolution of an active contour. Combining global shape descriptors given by the polygonal model with local curvature-based features, the leaves are then classified over leaf datasets. In this project we introduce a method designed to deal with the obstacles raised by such complex images, for simple and lobed tree leaves.

A first segmentation step based on graph cut approach is first performed, and later used to guide the evolution of leaf boundaries. And implement classification algorithm to classify the diseases and recommend the fertilizers to affected leaves.

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V. RESULTS AND OUTPUT:

Hardware-Schematic diagram

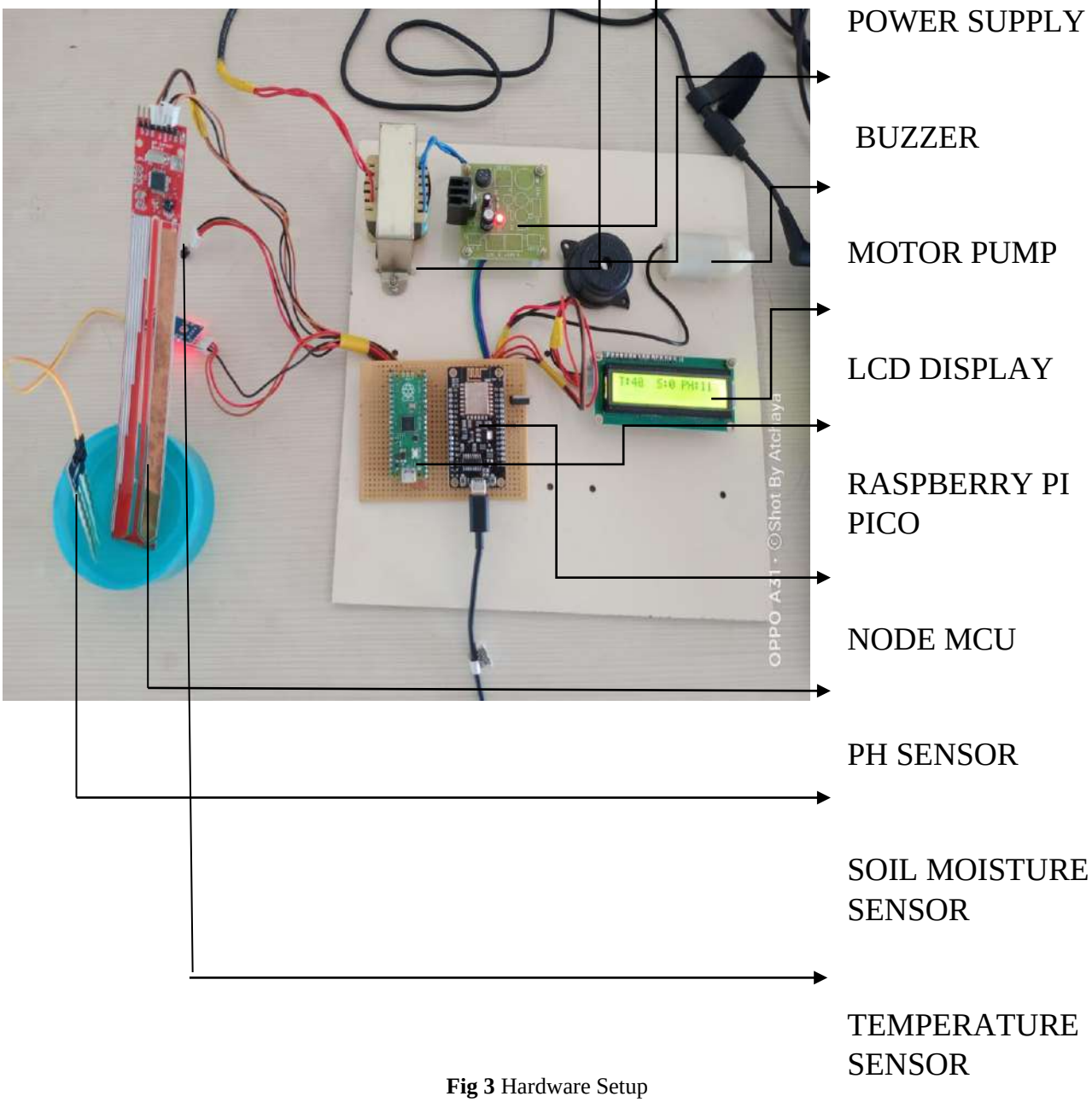

Fig 3 Hardware Setup

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Hardware Interface Program

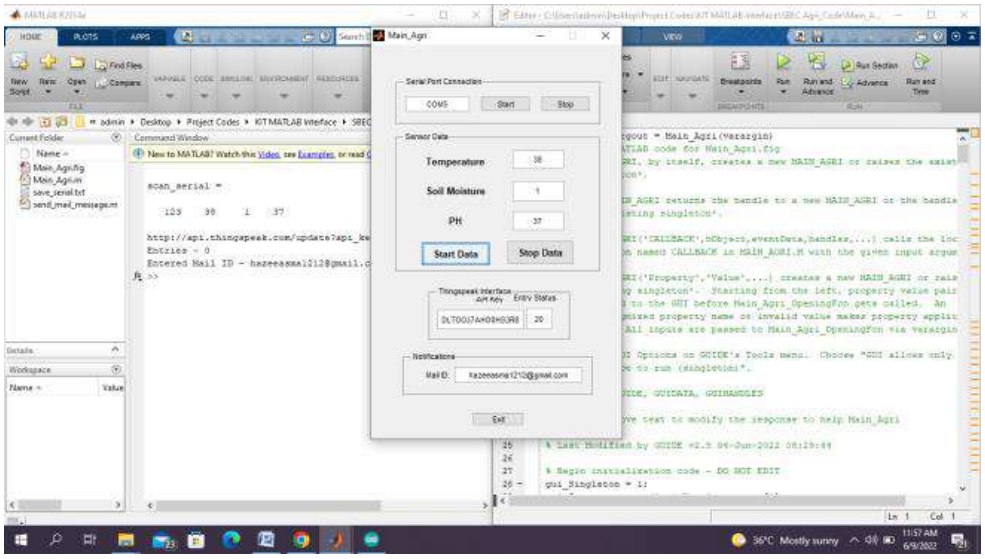

Fig 4 Program of Hardware Output in Mat lab

OUTPUT OF HARDWARE THROUGH THINGSPEAK

Fig 5 ph Value of the Soil

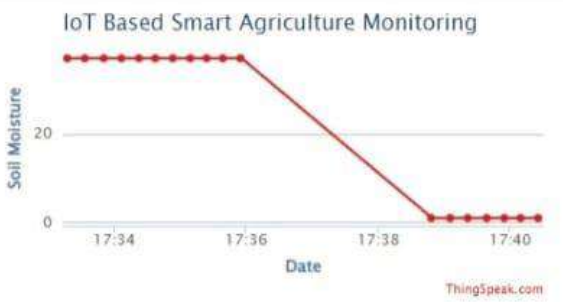

Fig 6 Moisture of the Soil

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Fig 7 Temperature of the Soil

The above figures shows the output from thingspesk window of hardware interface

SOFTWARE

Input Image

Fig 8 Input Image Pest/ Leaf/ Seed

Here is the sample input of the software phase , we designed this same program for leaves, pest as well as seed.

Gray Image

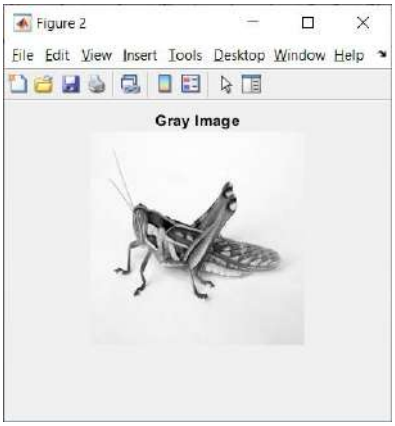

Fig 9 Gray Image

Conversion of gray image show in above figure

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Segmented Image

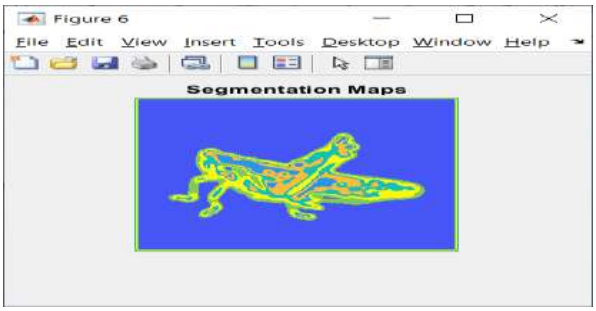

Fig 10 Segmented Image

Dialog Box

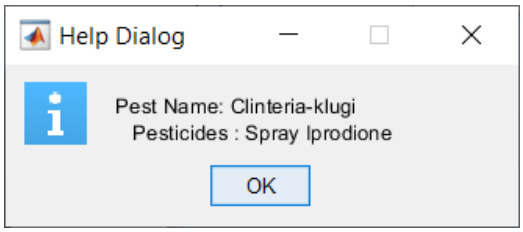

Fig 11 Output Dialog Box

NOTIFYING THE POTHOLES BY MAIL

Message via Mail

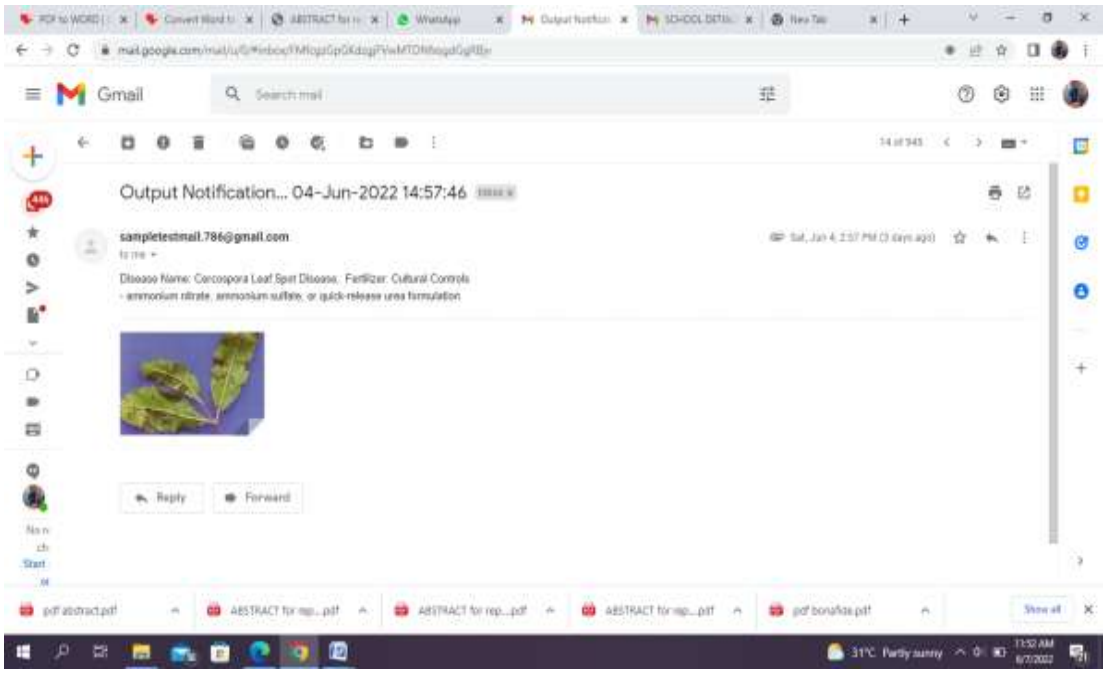

Fig 12 Captured Images Gets Received to Registered Mail

The images which are sent to the user by the server by mail is shown in above figure

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HARDWARE AND SOFTWARE SETUP

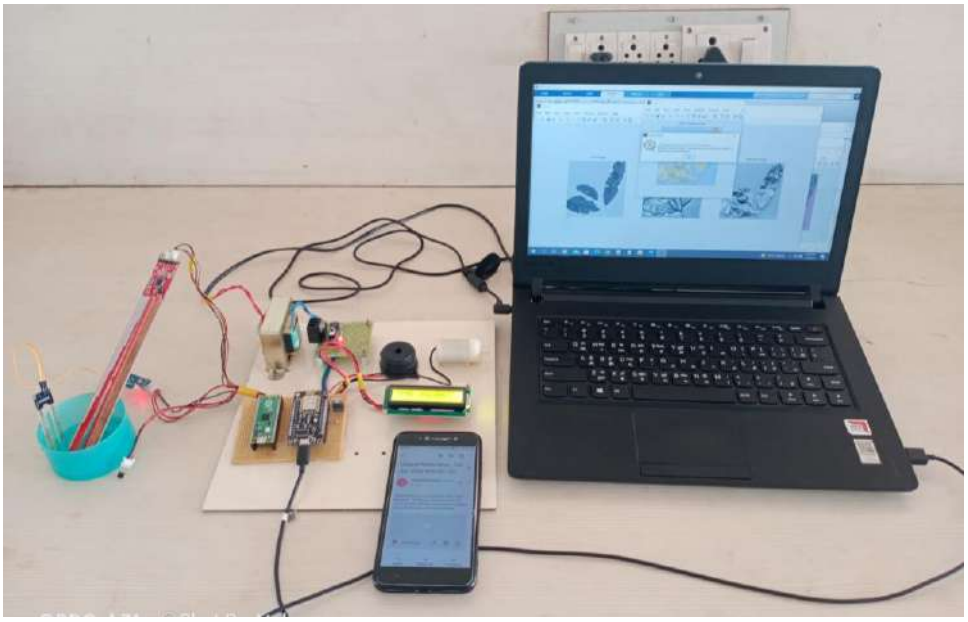

Fig 13 Software and Hardware Output

The setup of hardware and software along with output is shown in figure 13

VI. CONCLUSION

In this project, we overview the various techniques and algorithms are proposed for segmentation and classification methods for improve the quality of segmentation. But the result shows that segmentation algorithms do not work properly and can't implement in large datasets rather than proposed graph cut model. We have presented a method designed to perform the segmentation of a leaf in a natural scene, based on the optimization of a polygonal leaf model used as a shape prior for an exact active contour segmentation.

It also provides a set of global geometric descriptors that, later combined with local curvature-based features extracted on the final contour, make the classification into tree species possible. Finally implement neural network classification algorithm to classify the leaf diseases as bacteria, fungi and virus. Then recommend the fertilizers to affected leaves based on measurements.

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