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Research Article

Real Time Detection of Plant Disease

P. Ramanathan[*1], M.Antony Premchand [1], M. Dhananivetha [1]

[1] *Department of Agriculture Engineering, Nandha Engineering College, Erode, Tamilnadu, India.*

Technology is to build a prosperous nation. In this growing world, technology is also rapidly increasing. In addition to this, people ran towards agriculture too. So many technologies are developing in the field of agriculture. The farmers are facing problem in food production to equalize the need of world population. One of the major problems in the agriculture is productivity and yield. Productivity is decreasing rapidly due to disease attack in crops. It is very important to identify disease attack quickly or it will damage the whole field. So, our project is to identify the disease attack in crops and give the suitable pesticide to the target crop. We used image process technology to identify the disease attack by thermal camera captured images and feed the information in MATLAB software to get the disease attacked plant. After identifying the pest, suitable pesticide is sprayed through drone. Insecticides and pesticides are sprayed by drone in large scale farming by using remote control method from a particular distance. It helps the farmers to monitor environmental data which helps in smart farming and also to scout the field quickly. Thermal imaging detects infrared radiation, the thermal imaging camera does not emit radiation itself. In addition, it is a chemical-free method that is safe to use whether inside or outside a building.

Keywords: Disease Attack, MATLAB, Thermal Camera, Drone vehicle, Image Processing, Smart Farming.

1. Introduction

Agriculture is the way of life to Indian Economy. To feed the evergraoing population we are in a need to increase the productivity. There are various constraints to increase productivity such as weeds, pest, disease, poor soil fertility and economic status of farmners and labour shortage. Among these factors pest and disease cause serious loss to crop productivity.

To overcome these issues, the project is mainly developed to improve the efficiency of the pesticide usage for precision farming. In this we use fertilizer drone, thermal camera and a scanner with mobile application for scanning the diseases in the crop for decrease the pest attack and to increase the crop yield.

Image processing is defined as a method to perform some operations on some image, in order to get an enhanced or extract some useful information from it. The software used for processing the image is MATLAB.

2. Problem Identification

To ensure the real time application of plant disease and simultaneous site - specific application of pesticides. Pesticides are the common substances used in agriculture to control pest and disease. Most of the pesticides are associated with health and environmental issues. Exposure to pesticides can be through contact with the skin, ingestion, or inhalation. Excess pesticides leach to the environment and cause soil and water pollution. In crops, it starts accumulating in various

Correspondence should be addressed to
P. Ramanathan; ramanathangowtham007@gmail.com

parts of the crop and finally enter into the human system.

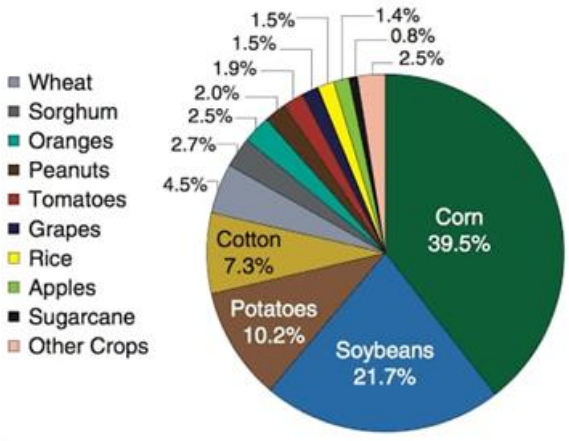

Fig.1. Pesticide use by crop, 21 selected crops, 2008, percent total pounds of active ingredient applied

3. Existing Problems due to Diseases in Crops

Plant disease have always been a challenge to crop production. In order to feed the ever growing global population we are in a need to produce more food. Among the various constrains that cause loss to food production pest and disease need much effective control which cause high loss to the quality of food crops.

Pest and disease cause huge loss to productivity by interfering with several process such as affecting photosynthesis, fruit and flower development, cell division and enlargement, growth or yield easily. Huge loss by pest and disease cause threat to livelihood of farmers. At, present to control pest and disease, pesticides are applied manually using hand sprayer. It cause effect to humans and also causes pollution to environment. It also causes threat to food security of our country. The plant disease can be detected through change in colour, shape and function of the plant parts such as leaf, flower and fruit.

Various plant pathogens and crop-feeding insects are integral part of agriculture system. There is complex and mutual relationship exists between pest and disease and crops. Pesticides may impact the crop physiology through various disruptions, such as perturbation in the development of the reproductive organs, growth reduction, and alteration of the carbon and/or nitrogen metabolism, leading to a lower nutrient availability for plant growth.

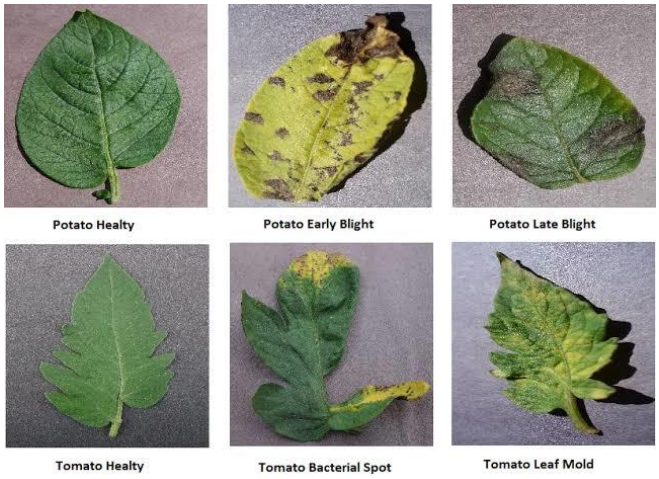

Fig.2. Sample Image

In various countries, it has been observed that a diet containing fresh fruit and vegetables are potential risks from eating very low residues of pesticides in crops. In recent years, there has been increasing evidence of pesticide residues in vegetables and fruits.

Objectives

- To capture the images of the diseased plant by mounting camera on the drone.
- To identify the diseased plant using image processing technology.
- Spraying suitable pesticides by using drone vehicle.

4. Image Processing

Image processing is defined as a method to perform some operations on some image, in order to get an enhanced or extract some useful information from it. The software used for processing the image in this study is MATLAB.

• From image sensor, signal converts into digital images.

• Removing noise and improve the clarity for further processing.

• Extract the grid, size, space or number of objects in a scene.

• Images for display are prepared.

• Communication can be done with compressed images across a network.

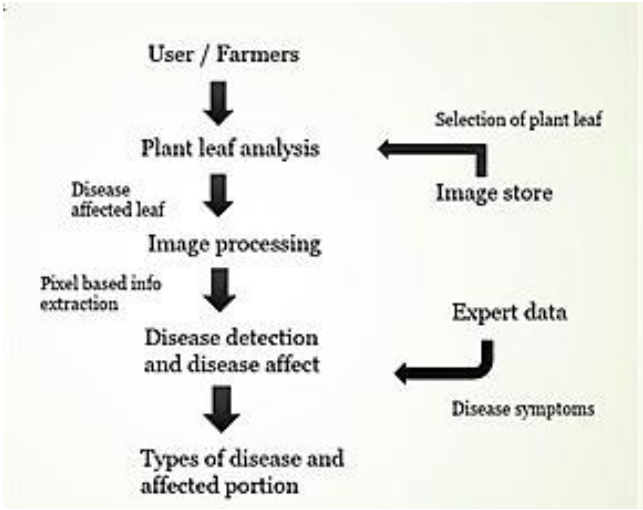

Fig.3. Block Diagram

5. Drone Description

Drone is the unpiloted aircraft or space craft. It can be remotely controlled with sensors and GPS. In agriculture it is used in pest detection soil moisture detection, disease detection, etc.,

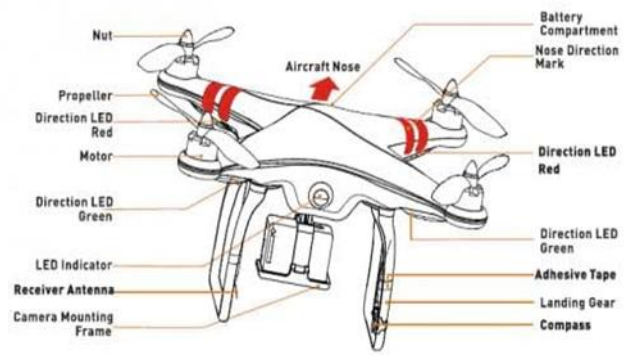

Fig.4. Parts of Drone

The main parts of drones are categorized as:

- motor
- frame
- propeller
- battery compartment
- transmitter and receiver antenna
- landing gear
- compass
- solar panel.

6.1. Thermal Imaging

Thermal cameras is used to capture image of the field for image processing. When equipped with the special thermal camera, Thermal radiation or energy (heat) are into the visible light by drones in order to analyse a particular object or scene. By recognizing and capturing different levels of infrared light, thermal camera detects the temperature. It is invisible to the naked eye but can be felt as a heat by human beings if passed in high intensity. The object which is hottest produce more radiation.

6.2. Spraying Pesticides Through Drone

- The suitable pesticides for the plant disease can be sprayed through drone.
- The nozzle that can be used is a flat fan type for spraying the liquid. Four nozzles are connected with ducts, and they are place between each other.
- Traditional pesticide spraying practice by human source can be replaced by using drone. It increases the efficiency by 40%. It saves 90% of the water consumption and 30-40 percent of pesticide usage.
- Droplet size is very small in drone spray which increases the efficiency of the insecticide. It also reduces the pesticide residue in the crop.

6.3. Advantages of Drone

- Quality aerial imaging. Drones are excellent for taking high quality aerial photographs and video and collecting vast amount of imaging data.
- By using drones, the farmers can optimize the use of inputs such as seeds, fertilizers, and water.

6.4. Solar Powered Drone

We can also fix solar panel to save our electricity. The drone will have 50 meters wingspan, will fly over 60000 feet (15 miles) clear of weather effects in bright sunlight, with sunlight as its only and primary source of power. The solar energy is used to fuel the drone is renewable as well, which means spending less money on drawing electricity from the grid to power the drones.

6.5. Advantages of Digital Images

- The processing of image is faster and more cost-effective.
- One needs less time for processing, as well as less film and other photographic equipment.
- Image processing is more ecological.
- Chemicals or fixed processing are not needed to take and process digital images.

6. Conclusions

Vision-based algorithm based on camera calibration method was proposed measurement. Using internal and external camera parameters, Planar pattern images were captured. Using the CMOS camera sensor module mounted on the Micro Aerial Vehicle, corners were extracted in the sequence of image frames with an accuracy 0.1 pixel. Calculated external camera parameter values are used to compute the Rotational and Translational vector of the camera about the yaw axis. This rotational and translational camera vector values can be used to estimate the heading and for the navigation of the Small Air Vehicle.

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