

Vision Based Plant Leaf Disease Detection on The Color Segmentation through Fire Bird V Robot

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Abstract

In today's world life the use of robot is going on increasing. Robot can able to carry work efficiently and effectively that man can do. In this paper one such application of robo can do is leaf diseases Detection. In this paper we review the need of simple plant leaves diseases detection system. that would facilitate advancements in agriculture through by using the Firebird V Robo up to the range 30cm. This techniques will improves productivity of crops. This paper includes several steps viz. Image acquisition, Image Pre-processing, Segmentation, Feature Extraction.

Keywords- Fire Bird V Robo, Plant Diseases, Image acquisition, Segmentation, Extraction

I. INTRODUCTION

Like human beings & other animals, plants are subject to diseases in order to maintain a sufficient food supply for the world's population. India is an agricultural country where in most of the population depends on agriculture. It plays a vital role in the Indian economy over 70% of the rural households depends on agriculture.[10]. There are many branches of science that control plant diseases. Among them are bio chemistry of breeding meteorology, mycology (fungi), nematology (nematodes), virology (viruses), Bio technology, soil science, genetics & plant need science. The study of plant diseases is called plant pathology.[2] Research in agriculture is aimed towards increases of productivity & food quality at reduced expenditure with increased profit. Diseases are impairment to the normal state of the plant that modifies or interrupts its functions such as photosynthesis, transpiration, pollination, fertile [11,12] & due to adverse environment conditions.

This objective of this paper is to concentrate on the plant leaf disease detection based on the texture of the leaf. [6]. Leaf presents several advantages over flowers and fruits at all worldwide the basic procedure of the proposed vision based detection algorithm in this paper is organized in to the following sections. In section First gives an introductory part includes importance of leaf diseases detection, plant leaves analysis, various types of leaf diseases and its symptoms. Section Second presents a detailed discussion on recent work carried out in this area. Section 3 includes basic methodology for leaves diseases detection which represents a brief review on image processing techniques.

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A. Plant Diseases Analysis and Its Symptoms

The RGB image feature pixel counting techniques is extensively applied to agricultural science. Image analysis can be applied for the following purposes:[3]

- 1) To detect plant leaf, stem, & fruit diseases.
- 2) To quantify affected area by diseases.
- 3) To find the boundaries of the affected area.
- 4) To determine the color of the affected area.
- 5) To determine size and shape of fruits.

Following are some common symptoms of fungal, bacterial & viral plant leaf diseases.

B. Fungal Disease

Fungi are identified primarily from their morphology, with emphasis placed on their reproductive structures. Among all plant leaf diseases those caused by fungus some of them are discussed below show in Fig. 1a pepper plant leaf diseases and Fig 1b: Bean Plant leaf diseases.



Fig. 1a: Pepper plant leaf diseases.



Fig. 1b: Bean plant leaf diseases

It first appears a lower, older leaves like water –soaked gray green spot and small brown spots with concentric regions that form a bull's pattern.

C. Bacterial Disease

Bacteria exists as single cells and increases in numbers by dividing in to two cells during a process called binary fusion. The diseases is characterized by tiny pale green spots, the dry dead spots as shown in Fig 2 a and b. bacterial leaf spot have brown or black water –soaked spots on the foliage .under dry conditions the spots have a speckled appearance. [6]



Fig. 2a: Bacterial Leaf Spot.



Fig. 2b: Bean Bacterial Leaf Spot.

D. Virus Disease

Viruses are extremely tiny particles consisting of protein and genetic material with no associated protein. Among all plant leaf diseases, those caused by viruses are the most difficult to diagnose .viruses are shown in Fig 3a and b.



Fig. 3a: Pepper leaf virus diseases



Fig. 3b: virus leaf diseases

II. LITERATURE SURVEY

Asst. Prof.Ketan Deshumukh using the fire bird V.ATMEGA a 2560 Robotic Waiter for doing research how we can use this in image Processing in this it will serve the refreshment to the customer and do the room service .[1]

Abdullah Shaikh and his members “Robotic arm movements wirelessly synchronized with human arm movements using real time image processing” in this master-slave control methodology where slave i.e robotic arm synchronously replicates the motion of master i.e human arm and gives to control a robotic arm by the MATLAB codes,components and layout.[2]

Aji Joy, Ajith P Somaraj, Amal Joe, Muhammad Shafi, Nidheesh T M Ball Tracking Robot Using Image Processing and Range Detection.In our project we use the color information of the ball to track the object. Better performance of the robot can be obtained if multiple features are monitored. The motion of the robot is controlled by a microcontroller based on the control signals received directly.[9]

Prof. Sanjay B.Dhaygude proposed a method vision based detection algorithm of various leaves .The first step of the algorithm is the color transformation structure for the input RGB image is created and converted to HIS. The second step is the green pixels are masked and removed using specific threshold value ,then the image is segmented and extracted is computed from SGDM matrices. Finally the presence of diseases on the plant leaf is evaluated [3].

Jayme Garcia Arnal Barbedo in Springer plus Open journal paper is Digital image processing techniques for detecting quantifying and classifying plant diseases. It presents a survey on methods that use DIP techniques to detect, quantify and classify plant diseases and it is to be useful for researchers working both on vegetable pathology and pattern recognition, providing a comprehensive and accessible from digital images in the visible spectrum [4].

S.Arivazhagan proposed a method “Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features” In this paper author explained the application of texture analysis in detecting and classifying the plant leaf diseases using texture feature. In this paper ten species of plants namely banana, beans, jack fruit are tested and control tools can be used to save test problem while minimizing risks to people and the environment.[5]

Prof.A.B.Patil proposed a method “ Plant Diseases detection Using Image Processing “ in this various techniques to segment the diseases part of the plant and also discussed some feature extraction and classification of plant diseases .The use of ANN methods to classify of disease in plants such as feature map, back propagation algorithms.[6]

Prof S.P.Godse described the development of android applications and morphological algorithm. In Android mobile phone takes the photographs of the plant leaves and started in oracle database .The algorithm that acquires morphological features of the leaves, computes angle code histogram then classifies the species based on novel combination of a computed matrices detection and classification of plant leaf diseases [7].

H. Al-Hiary discussed the application of K-means clustering and neural networks have been formulated for clustering and classification of diseases that effect on plant leaves. In this K-means clustering algorithm tries to classify objects based on the set of features in to k number of classes .The classification is done by minimizing the sum of squares of distance between the objects and the corresponding cluster or class centroid .In second step masking the green pixels and the pixels on the boundaries .In this masking OTSU’s method is applied in fast and accurate detection and classification of plat diseases.[8]

Jayamala K.Patil,Raj Kumar describe the advances in various methods used to study plant diseases/traits using image processing.This paper increasing throughput and reducing subjectiveness arising from human experts in detecting the plant diseases in paper titled Advances In Image Processing For Detection Of Plant Diseases.[10]

The idea put forward by Abdullah sheikh and members in the paper gives a proper guidance to control a robotic arm (exact human arm) using real time image processing and is supported by the MATLAB codes, components and layouts.

III.METHODOLOGY

There are five basic steps used for the detection of plant leaf disease as shown in Fig.5.The processing scheme consists of image acquisition through digital camera connecting to the Fire bird V Robo, image pre-processing includes image enhancement and image segmentation where the affected and useful area are segmented feature extraction and classification. Finally the presence of diseases on the plant leaf will be identified .In the initial step, RGB images of leaf samples were picked up. The step-by-step procedure as shown below:

- 1) Firebird Atmega 2560 Robot
- 2) RGB image acquisition.
- 3) Convert the input image into color space.
- 4) Segment the components.
- 5) Obtain the useful segments.
- 6) Computing the texture features.
- 7) Configuring the neural networks for recognition

A. Firebird Atmega 2560 Robot

Fire Bird V is designed by NEX Robotics and Embedded Real-Time Systems lab, CSE IIT Bombay.

Features of firebird V :

- Ideal for doing research in the areas of robotics, embedded systems, artificial intelligence and sensor networks etc.



Fig. 4: Fire Bird V Robo

- Covers wide range of subjects like Microcontrollers, Embedded Systems, Mechatronics, Sensor Networks, Image processing
- Modular Design: Unique layered design gives versatility in design
- Powered by rechargeable 9.6V 2100mAh NiMh battery pack High performance white line sensors with the illumination modulation facility for improved performance in line grid based navigation with improved power conservation
- Up to five IR range sensors covering front half of the robot with range up to 150cm for intelligent navigation
- Supports four DC motors with position encoders
- Easy to interface with PC using wired and wireless communication
- Supports 2.4GHz Wireless ZigBee for communication with multiple robot Easy hardware integration for adds on sensors like GPS, Magnetometers, accelerometers and gyroscope.

B. Image Acquisition

The image of various leaves acquired using a Fire Bird V Robo using a digital camera in agriculture field with required resolution for better quality. The construction of an image database itself is responsible for the better efficiency and dependent on the application.[10]

C. Image Pre-processing

To improve the image data that suppress undesired distortions enhances some image features important for further processing and analysis task .It includes color space conversion, image enhancement and image segmentation. The RGB images of leaves are converted into color space representation. RGB images converted into Hue Saturation Value (HSV) color space representation. Hue is a color attribute that describes pure color as perceived by an observer. Saturation termed as relative purity or the amount of white light added to hue and value means amplitude of light. There are various techniques for image segmentation are Region Based, Edge Based, Threshold based.[6]

D. Feature Extraction

It plays an important role for identification of an object .In many application of image processing feature extraction is used. Color, Texture, Morphology, Edges etc. are the features which can be used in plant diseases detection. They have found that morphological result gives better result than the other features. Texture means how the color is distribute in the image , the roughness ,hardness of the image .It can also be used for the detection of infected plant areas.[8]

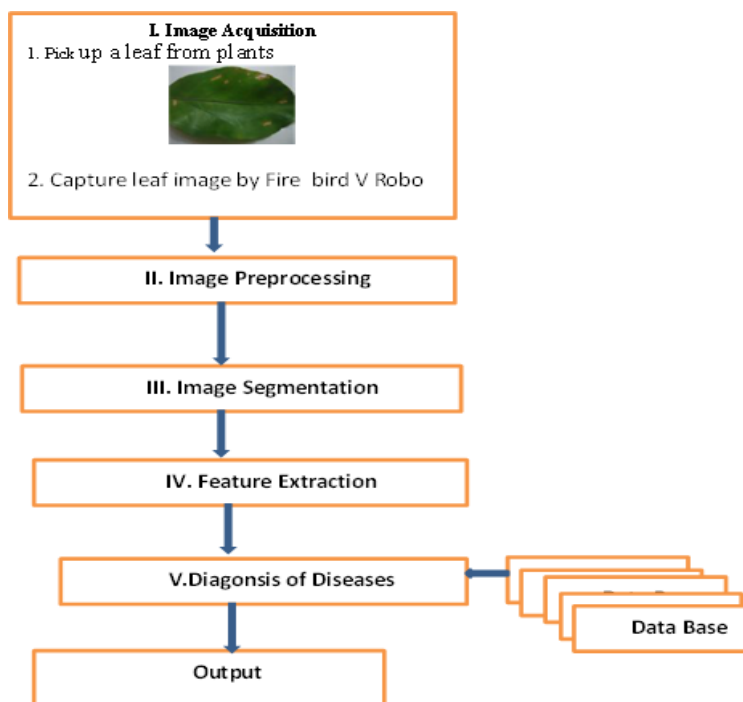


Fig. 5: Implementation of Plant Leaf Diseases Detection.

IV. CONCLUSION

Our undertaken project is thus going to be useful for farmers, horticulturists and to trekkers by providing an useful plant leaf identification system and will eventually identify their diseases. It is the system which identifies the affected part of leaf spot by using image processing techniques and Fire bird V robo. There are two main characteristics of plant disease detection using machine-learning methods that must be achieved, they are: speed and accuracy. Hence there is a scope for working on development of innovative, efficient & fast interpreting algorithms which will help plant scientist in detecting disease.

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