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Surveying on Fruit Disease Recognition Using Machine Learning

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ABSTRACT: This paper presents a survey on detection and classification of fruit diseases. It is difficult for human eyes to identify the exact type of fruit disease which occurs on the fruit of plant. Thus, in order to identify the fruit diseases accurately, the use of image processing and machine learning techniques can be helpful. The images used for this work were acquired from the fruit field using digital camera. In the pre-processing step, background removal technique is applied on the image in order to remove the background from the image. Then, the background removed images are further processed for the image segmentation using Otsu thresholding technique. Different segmented images will be used for extracting the features such as a colour, shape and texture from the images. At last, these extracted features will be used as the inputs of classifier. Fruit diseases cause significant damage and the economic losses in crops. Subsequently, reduction in the fruit diseases by early diagnosis results in the substantial improvement in quality of the product. Erroneous diagnosis of disease and its severity leads to an inappropriate use of pesticides.

KEYWORDS: Fruit Recognition, weather prediction, SIFT.

I. INTRODUCTION

Recognition system is an grand challenge for the computer vision to achieve the near human levels of recognition. In the agricultural sciences, images are the important source of the data and information. To reproduce and report such data photography was the only method used in the recent years. It is difficult to process or quantify an photographic data mathematically. Digital image analysis and image processing technology circumvent these problems based on the advances in the computers and microelectronics associated with traditional photography. This tool helps to improve the images from the microscopic to telescopic visual range and offers a scope for their analysis.

The approach introduced in this paper can be used for designing the automatic systems for an agricultural process using images from a distant farm fields. Several applications of the image processing technology have been developed for the agricultural operations. These applications involve an implementation of the camera based hardware systems or the color scanners for inputting the images. We have attempted to extend the image processing and analysis technology to a broad spectrum of the problems in the field of agriculture. The computer based image processing is an undergoing rapid evolution with ever changing computing systems. The dedicated imaging systems available in a market, where user can press a few keys and get the results, are not very versatile and more importantly, they have a high price tag on them. Additionally, it is hard to understand as to how an results are being produced. Diseases appear as a spots on a

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fruits and if not treated on the time, cause severe losses. Excessive uses of the pesticide for an fruit disease treatment increases the danger of toxic residue level on an agricultural products and has been identified as a major contributor to the ground water contamination. Pesticides are also among an highest components in the production cost thus their use must be minimized. Therefore, we have attempted to give an approach which can identify the diseases in a fruits as soon as they produce their symptoms on the growing fruits such that a proper management application can be applied. We have developed an mobile system that can measure the diseases of the fruit from that fruit image taken by the user's Smartphone. Once the user captures the image of the fruit item on a plate, the image is sent to the cloud for the diseases recognition and computation. And also user search prediction using the Google API. Fruit recognition is done by deep learning running in the cloud: the image is recognized and the diseases details matching the image are fetched from the database that also exists in the cloud. The result is then prompted back to the user's phone. In our system, for calibration, the user has to put his/her thumb near the fruit when the fruit picture is taken. The components of our system where we have used Scale invariant feature transform (SIFT) for image processing. Recognition system is an grand challenge for the computer vision to achieve near human levels of the recognition. In agricultural sciences, images are an important source of the data and information. The approach introduced in this project can be used for designing a automatic systems for an agricultural process using images from the distant farm fields. Several applications of an image processing technology have been developed for a agricultural operations. These applications involve an implementation of a camera based hardware systems or a color scanners for inputting the images. We have attempted to extend an image processing and the analysis technology to an broad spectrum of a problems in the field of agriculture. The computer based image processing is an undergoing rapid evolution with ever changing computing systems. The dedicated imaging systems available in a market, where user can press a few keys and get the results, are not very versatile and more importantly, they have the high price tag on them. It is hard to understand as how the results are being produced. Diseases appear as spots on a fruits and if not treated on time, can cause the severe losses. Excessive uses of the pesticide for fruit disease treatment increases the danger of toxic residue level on the agricultural products and has been identified as a major contributor to the ground water contamination. Pesticides are also among an highest components in an production cost thus their use must be minimized. Thus, we have attempted to give an approach which can identify the diseases in an fruits as soon as they produce their symptoms on the growing fruits such that the proper management application can be applied.

II. LITERATURE REVIEW

Paper Name : **Plant Disease Detection Using Leaf Pattern: A Review(2015).**

Author : Vishnu S, A. Ranjith Ram.

In this paper, they discuss a various methodologies for plant disease detection. Studies show that relying on the pure naked-eye observation of experts to detect and classify the diseases can be time consuming and expensive, especially in the rural areas and developing countries. So they present fast, automatic, cheap and the accurate image processing based solution. Solution is composed of the four main phases; in the first phase we create a color transformation structure for the RGB leaf image and then, they apply an colour space transformation for the colour transformation structure. Next, in the second phase, the images are segmented using a K-means clustering technique. In third phase, they calculate an texture features for the segmented infected objects. Finally, in the fourth phase the extracted features are passed through the pre-trained neural network.

Paper Name : **Detection of Diseases on Cotton Leaves Using K Mean Clustering Method(2015).**

Pawan P. Warne, Dr. S. R. Ganorkar .

In this paper, presents an approach for the careful detection of diseases, diagnosis and the timely handling to prevent crops from the heavy losses. The diseases on the cotton are critical issue which makes the sharp decrease in production of cotton. So for the study of interest is the leaf rather than the whole cotton plant because about 8595 of the diseases occurred on the cotton leaves like Alternaria, Cercospora and Red Leaf Spot. In this proposal initially a pre-processing

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the input image using the histogram equalization is applied to increase the contrast in the low contrast image, K means clustering algorithm is used for an segmentation which classifies objects based on a set of features into K number of classes and finally classification is performed using Neural network. Thus image processing technique is used for detecting diseases on cotton leaves early and accurately. It is used to analyze the cotton diseases which will be useful to the farmers.

Paper Name : **Combining Local and Global Image Features for Object Class Recognition(2016).**

Author : Dimitri A. Lisin, Marwan A. Mattar, Matthe w B. Blaschko.

In this paper, the Object recognition is an central problem in the computer vision research. Most object recognition Systems have taken one of the two approaches, using either global or Local features exclusively. This may be in part due to the difficulty of combining a single global feature vector with a set of local features in a suitable manner. In this paper , they show that combining local and the global features is beneficial in an application where rough segmentations of objects are available . They present a method for the classification with the local features using a non-parametric Density estimation. Subsequently, they present the Two methods For combining the Local and Global features. They first used a “stacking” ensemble technique, and the Second uses an hierarchical classification system. Results show the superior performance of these combined methods over an component classifiers, with the reduction of over 20 in an error rate on the challenging marine science application.

Paper Name : **A Study and Implementation of Active Contour Model For Feature Extraction: With Diseased Cotton Leaf as Example(2016).**

Author : P.R. Rothe A and R. V. Kshirsagar A.

In this paper, the Feature extraction is an significant constituent of the pattern recognition system. It carries out the two assignments: converting input parameter vector into the feature vector and or reducing its dimensionality. The distinct feature extraction algorithm makes a classification process more effectual and efficient. The allocation and recognition of the cotton leaf diseases are of the major importance as they have a cogent and the momentous impact on the quality and production of the cotton . In this work, they present the snake based approach for the segmentation of images of the diseased cotton leaves. They extract Hu’s moments which can be used as the shape descriptors for the classification. A theory of the two-dimensional moment invariants for the planar geometric figures is also presented. Three diseases have been considered, namely the Bacterial Blight,

Paper Name : **Classification of Cotton Leaf Spot Diseases Using Image Processing Edge Detection Techniques(2017).**

Author : P. Revathi, M. Hemalatha.

In this Paper, an advance computing technology that has been developed to help the farmer to take the superior decision about many aspects of the crop development process. Suitable evaluation and an diagnosis of the crop disease in the field is very critical for the increased production. Foliar is a major important fungal disease of the cotton and occurs in all the growing Indian regions. In this work ,they express the new technological strategies using the mobile captured symptoms of the cotton leaf spot images and categorize the diseases using the HPCCDD Proposed Algorithm . The classifier is being trained to achieve an intelligent farming, including early Identification of a diseases in the groves, selective fungicide application, etc. This proposed work is based on the Image RGB feature ranging techniques used to identify the diseases (using Ranging values) in which, the captured images are processed for the enhancement first. Then color image segmentation is carried out to get the target regions (disease spots). Next Homogenize techniques like the Sobel and the Canny filter are used to Identify the edges ,these extracted edge features are used in the classification to identify the disease spots. Finally, the pest recommendation is given to the farmers to ensure that their crop and reduce the yeild loss.

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III. EXISTING SYSTEM

Existing system was the manual process. In existing system farmer need to visit the nearest Agricultural Research Center. Then agriculture research center identify the disease on the fruit after that farmer get to know the disease and the solution on disease. This is very long process and the time consuming as well. Farmer needs to visit the agriculture center frequently.

IV. PROPOSED SYSTEM

In this project, we propose an mobile application that helps the farmers for identifying the fruit disease by uploading an fruit image to the system. The system has an already trained dataset of images for the fruit. Input image given by the user undergoes the several processing steps to detect the severity of disease by comparing with the trained database images. First the image is resized and then its features are extracted on the parameters such as color,color of the wavelet transform. Next, classification is done to separate the image as infected or non-infected.

Advantage of proposed System

- Our system is built on fruit image processing and uses nutritional fact tables.
- Required less time
- The experimental result shows that our application is as accurate as a reference device.
- We perform a detailed security analysis and performance evaluation of the proposed data
- Increase Efficiency
- improve the accuracy.

V. SYSTEM ARCHITECTURE

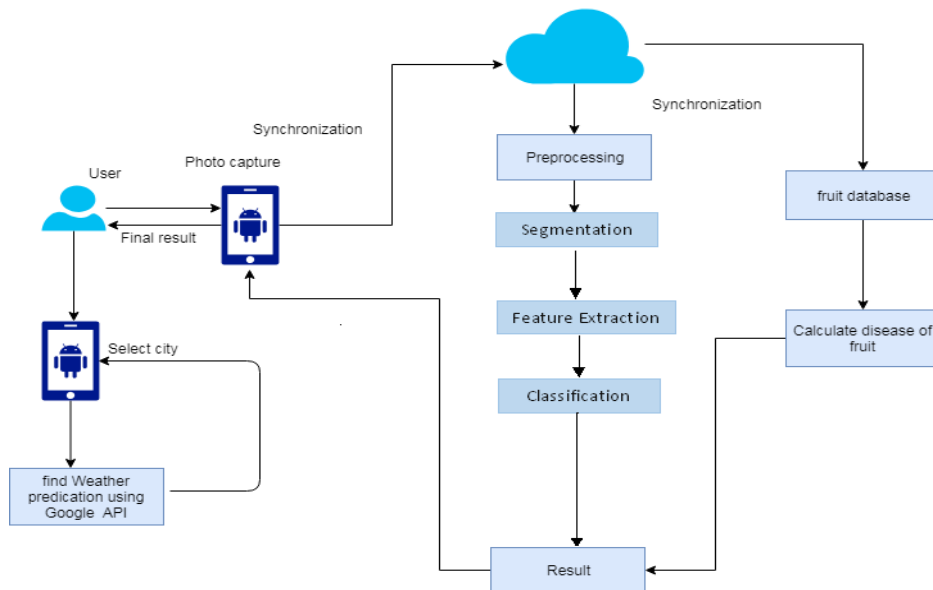


Fig.: System Architecture

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Image is taken from Camera. Then preprocessing will be done .
Feature Extraction will be done using SIFT/WAVELET Transform. Database feature and Query image Feature Extraction have a same method.
They are saved in different different .mat file.
This feature are useful for prediction. SVM is used as a Classifier.

Image Pre processing

In image preprocessing, the image data recorded by an sensors on a satellite restrain errors related to the geometry and the brightness values of the pixels. These errors are corrected using the appropriate mathematical models which are either definite or an statistical models. Image enhancement is a modification of the image by changing the pixel brightness values to improve its visual impact. Image enhancement involves an collection of the techniques that are used to improve the visual appearance of an image, or to convert the image to a form which is better suited for the human or a machine interpretation.

Feature Extraction

A feature extraction techniques are developed to extract the features in the synthetic aperture radar images. This technique extracts the high-level features needed in order to perform classification of the targets. Features are those items which uniquely describe an target, such as size, shape, composition, location etc. Segmentation techniques are used to isolate a desired object from the scene so that the measurements can be made on it subsequently. A Quantitative measurements of the object features allow the classification and description of the image.

Segmentation

Segmentation is one of a key problems in the image processing. Image segmentation is a process that subdivides an image into its constituent parts or the objects. The level to which this subdivision is carried out depends on a problem being solved, i.e., an segmentation should stop when objects of interest in an application have been isolated e.g., in the autonomous air-to-ground target acquisition, suppose our interest lies in identifying the vehicles on a road, the first step is to segment the road from the image and then to segment an contents of the road down to the potential vehicles. Image thresholding techniques are used for the image segmentation.

The support vector machine (SVM) is a supervised learning algorithm that can be used for the binary classification or the regression. Support vector machines are popular in the applications such as natural language processing, speech and the image recognition, and a vision.

The support vector machine constructs an optimal hyper plane as the decision surface such that the margin of the separation between the two classes in the data is maximized. Support vectors refer to a small subset of training observations that are used as a support for the optimal location of the decision surface. Support vector machines fall under the class of machine learning algorithms called the kernel methods and are also referred to as a kernel machines.

Training for the support vector machine has two phases:

1. Transform predictors (input data) to the high-dimensional feature space. It is sufficient to just specify a kernel for this step and the data is never explicitly transformed to a feature space. This process is commonly known as a kernel trick.
2. Solve the quadratic optimization problem to fit an optimal hyper plane to classify a transformed features into the two classes. The number of transformed features is determined by the number of the support vectors.

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VI. CONCLUSION AND FUTURE WORK

This project focuses on developing the automated fruit diseases. It saves the time and effort, In this paper, we have proposed a new method for measuring the fruit diseases of the fruit object and find the weather prediction. With then right combination of mobile and the cloud computing we were able to obtain the estimated distance from the mobile device and used it to process the image in the cloud. This enabled us to process all the images from the same scale and further enabling us to determine the diseases value of the fruit object. Using deep learning we were able to extract the features of an leaf object and further classify it accurately. Study involved collecting fruit samples from the different regions. Work was carried out to investigate the use of the computer vision for classifying the fruit diseases. Algorithms based on the image-processing techniques, feature extraction and classification, were deployed. The feature extraction process used the color co-occurrence methodology, which uses the texture of an image to arrive at a unique features, which represent that image.

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