Plant Leaf Identification and Disease Detection

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Abstract- *Plant leaf identification and disease detection play an important role in both agriculture and horticulture fields. Here leaves are considered for name identification and disease detection, as they possess several features and most commonly the symptoms of any disease can be seen. The leaf image is captured using web camera interfaced with raspberry pi 3 b+. SIFT algorithm is used for extracting the features of the leaf.*

Keywords- Leaf name identification, disease detection, Raspberry Pi, OpenCV and Python

I. INTRODUCTION

Plant Leaves are one of the most important parts of the plant. Identification of leaf helps in classifying the variety of plant and its family. The leaves are of different types, exemplified by their form and shape as well as other characteristics. Leaf shape can vary considerably. The most common shapes include oval, truncate, elliptical, lanceolate, and linear. The shape is one of the most important features for describing an object. The disease detection in plants plays an important role in the agriculture field, as having a disease in plants are quite natural. The symptoms of diseases affected in plants most commonly appear on leaves. Hence, we use plant leaves for both plant name identification and disease detection. The plant leaf name identification and disease detection can be done by using image processing. The image processing is defined as processing digital images by means of a digital computer. The process of acquiring an image, extracting(segmentation) the individual characters, describing the characters in a form suitable for computer processing, and recognizing those individual characters are the scope of image processing. The fundamental steps in image processing involve image acquisition, image enhancement, image segmentation, feature extraction, color image processing, image restoration, object recognition, morphological processing, etc..

II. LITERATURE SURVEY

Shubham Lavania, et. al.,[1] used two methods for leaf recognition, they are SIFT algorithm and the Contour based edge detection using MATLAB. The system was able to classify 33 different kinds of leaf species presented in the Flavia database.

Anand R, et.al.[2] proposed a work that elaborates possible disease of brinjal using k-means clustering algorithm and ANN by computing various parameters such as Area, Centroid, Perimeter, Mean intensity for identifying the diseases of brinjal.

Apeksha Thorat, et.all[3] proposed work by interfacing the sensors with Raspberry Pi and wireless communication has been established using the IoT. Masking of the green pixels has been done for detecting the disease on the leaf.

Giriraja C.V.,et.al[4] used image processing and a four-wheeled robot which clicks the photos of the plant and transfer it to sever for analysis of disease using MATLAB. Otsu Thresholding method is used for disease detection in which the white portion shows the disease.

III. COMPONENTS

The hardware components are used for the project has been mentioned below:

A. Raspberry Pi

Raspberry Pi 3 B+ is one of the most popular controllers in industry. It is like a minicomputer which consists of the USB port, input-output pins, Wi-Fi port, HDMI port, SD card reader and much more functionality.

B. Web camera

The web camera is interfaced with Raspberry Pi is used to capture the image placed in front of a web camera.

C. SD card

Sd card is used for storage purpose. Sd card (class 10) is used as it is very fast.

The software components are used for the project has been mentioned below:

A. Rasbian Operating System

NOOBS (New Out Of Box) is an easy operating system installed which contains raspbian and LibreELEC. It also provides a selection of alternative OS which is then downloaded from the internet and installed.

B.OpenCV

OpenCV can be interfaced with python for image processing. It is mainly aimed at real-time computer vision. It is written in c++ and its primary interface in c++, OpenCV has also supported programming language such as python, java, MATLAB and here we are using OpenCV python.

IV. METHODOLOGY

In the proposed system, we are trying to identify leaf name and various diseases attacked in different species of the plant using their leaves. Here python programming language is used, OpenCV software library is used in python. Along with the disease name, the name of the leaf pertained to which plant are also identified. Image of the plant leaf is taken via web camera of 2MP and resolution of 640*480.
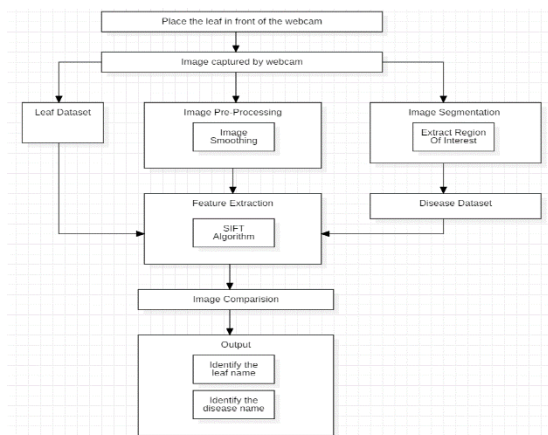

Fig.1.System Architecture

This project is carried out by implementing the following steps:
1. Image Acquisition
2. Image Pre-processing
3. Image Segmentation
4. Feature extraction

1. Image Acquisition

In acquisition, the leaf images are captured in real time by a web camera mounted on raspberry pi 3 b+. The captured leaf image will be stored as a dataset on Raspberry Pi's SD card and used for further analysis.

2.Image Pre-processing

In Image pre-processing, the leaf image that is captured will be converted from RGB to Grayscale. Image Smoothing is the method that is used to reduce noise within an image by blurring it.

3. Image Segmentation

Image Segmentation is the process of dividing the image into groups of pixels based on some criteria. A Region Of Interest(ROI) is the samples within a data set that are identified for a particular purpose. Here we extract the ROI of leaf diseases and store it in the dataset.

4.Feature extraction

The purpose of feature extraction is to extract individual differences that can distinguish different identification characteristics. On the other hand, the purpose is to extract leaf features from the high dimensional data to obtain useful information to describe and characterize the key plant leaf information

V. CONCLUSION

The project presents a framework for plant leaf name identification and disease detection using image processing techniques. The research has been undertaken and motivated in order to help agriculture and horticulture fields. There are two modules in this project 1. Leaf name identification pertained to which plant 2. Disease detection. Features are extracted and compared using the SIFT algorithm.

FUTURE WORK

For future development, the system can be integrated with GSM and other sensors such as soil moisture sensor, humidity sensor, temperature sensor etc., and convert it to an IoT project. Further, for increasing the speed of the comparison database can be used instead of the dataset.

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