Fruit Disease Detection Using Machine Learning

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Abstract- *Crop cultivation plays an important role within the agricultural field. Presently, the loss of crop is especially thanks to infected crops, which reduces the assembly rate. It is very difficult to watch the diseases manually. It requires an incredible amount of labor, expertise and excessive time interval. Hence deep learning used for the detection of diseases with more accuracy. This paper aims at providing a cost-effective and one-time solution to detect fruit diseases. SIFT is used for feature extraction and classification. Machine learning concepts will help to identify the diseases in fruits with more accuracy. Hence this leads to predicting the disease in early stage in order that the required actions to cure them are often taken immediately.*

Keywords- Fruit Diseases, SIFT, python, flask.

I. INTRODUCTION

The classical approach for detection and identification of fruit diseases is predicated on the eye observation by the experts. In some developing countries, consulting experts are expensive and time consuming thanks to the distant locations of their availability. Automatic detection of fruit diseases is important to automatically detect the symptoms of diseases as early as they seem on the growing fruits. Fruit diseases can cause major losses in yield and quality appeared in harvesting. To know what control factors to require next year to avoid losses, it's crucial to acknowledge what's being observed. Some disease also infects other areas of the tree causing diseases of twigs, leaves, and branches. For example, some common diseases of apple fruits are apple scab, apple rot, and apple blotch. Apple scabs are gray or brown corky spots. Apple rot infections produce slightly sunken, circular brown or black spots which will be covered by a red halo. Apple blotch may be a fungal disease and appears on the surface of the fruit as dark, irregular or lobed edges. Visual inspection of apples is already automated within the industry by machine vision with reference to size and color. However, detection of defects remains problematic thanks to natural variability of complexion in several sorts of fruits, high variance of defect types, and presence of stem/calyx. The studies of fruit are often determined by apparent patterns of specific fruit and it's critical to watch health and detect disease within a fruit. Through proper management action like pesticides, fungicides and chemical applications one can promote control of diseases which interns improve quality. There are various approaches available like spectroscopic and imaging technology, applied to realize better disease control and management. The increased in amount of commercialization agricultural farms are always on the design bent reduce man power in whatever way possible without affecting the productivity. A particular aspect to look upon is to use automatic harvesters which would significantly economize the entire process. Fruit detection system has its major application in robotic harvesting. However the technology are often custom made to be suitable for other applications like disease detection, maturity detection, tree yield monitoring and other similar operations. Varieties of fruits are being exported everywhere the planet with the event in cold storage facilities and transportation. It becomes the need of maintaining the very best level export quality which is especially administered by visual checking by experts. This is expensive and time consuming thanks to distant location of farms. Precision Agriculture helps the farmers to supply with sufficient and economical information and control technology thanks to the event and disclosure in various fields. The objectives are agricultural input systemization, profit hike and environmental damage reduction. So, during this work, an answer for the detection and classification of fruit diseases is proposed and experimentally validated. This system takes input as image of fruit and identifies it as infected or by classifying it into four categories namely parasitic, viral, bacterial and fungal . The technique which helps the farmers to spot disease properly by using this proposed work.

II. RELATED WORK

The related work presents a better and modern proposed solution for the detection of fruit diseases using their physical attributes. The proposed methods are composed of K-Means clustering technique, ANN and SVM. K-Means is used for the image Segmentation. It has a function of mapping images to their corresponding disease classes supported the phenotypic characteristics like the feel ,color, structure of holes on the fruit and physical make-up. ANN (Artificial Neural Network) is pragmatic in achieving enhanced leads to relations to the accuracy of detection and classification have some advantages over the opposite algorithms. They utilize

quite little pre-processing with regard to other image classification methods. It implies the filters were studied by the network that in traditional methods were hand-engineered. This autonomy from earlier information and human exertion in feature design may be a major advantage. A Support Vector Machine SVM is also used with the ANN to extend the high rate of classification. The proposed solution can significantly engineer precise detection and automatic classification of fruit disease.Another research works states methodology of image processing is used as a tool to monitor the diseases on fruits during farming, right from plantation to harvesting. For this purpose artificial neural network concept is employed . Three diseases of grapes and two of apple are selected. The system uses two image databases, one for training of already stored disease images and therefore the other for implementation of query images. Back propagation concept is employed for weight adjustment of coaching database. The images are classified and mapped to their respective disease categories on basis of three feature vectors, namely, color, texture and morphology. From these feature vectors morphology gives 90% correct result and it's quite other two feature vectors. This paper demonstrates effective algorithms for spread of disease and mango counting. Practical implementation of neural networks has been done using MATLAB.A later research work proposes a method consisting of two primary phases; (a) detection of lesion spot on the citrus fruits and leaves; (b) classification of citrus diseases. The citrus lesion spots are extracted by an optimized weighted segmentation method. which is performed on an enhanced input image. Then, color, texture, and geometric features are fused during a codebook. Furthermore, the simplest features are selected by implementing a hybrid feature selection method, which consists of PCA score, entropy, and skewness based covariance vector. The selected features are fed to Multi-Class support vector machine (M-SVM) for final citrus disease classification. The proposed technique is tested on Citrus Disease Image Gallery Dataset, Combined dataset (Plant Village and Citrus Images Database of Infested with Scale), and our own collected images database.

III. SYSTEM IMPLEMENTATION

The proposed system is implemented in the following architecture. The system takes a fruit image as input. The input is validated in order to maintain data integrity. Once validation is completed the SIFT technique is implemented where the entire process is divided into 4 phases. At first phase Constructing a Scale Space is established, to make sure that features are scale-independent. At second phase Key point Localisation is done in order to identify the suitable features or key points. Later on at phase three Orientation Assignment is initiated in order to ensure the key points are rotation invariant. At the final phase Key point Descriptor is constructed to assign a unique fingerprint to each key point. Overall technique includes feature extraction from input images. Once the sparse matrix is created after this process the output is passed to trained model which matches the sparse matrix with the pretrained images and predicts the disease name. The GUI is designed using flask module with HTML,CSS and backend is programmed with python script.

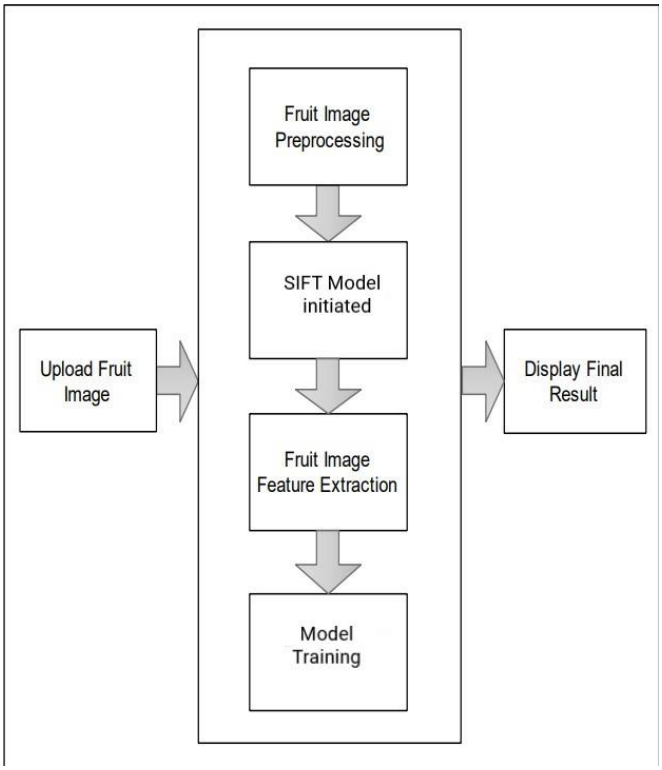

Figure1. High Level Design of Proposed Methodology

IV. EXPERIMENTAL RESULT

The system is being designed and following outputs have been obtained as results.

In figure 2 shows the user options to login or create a account in order to access the proposed system portal

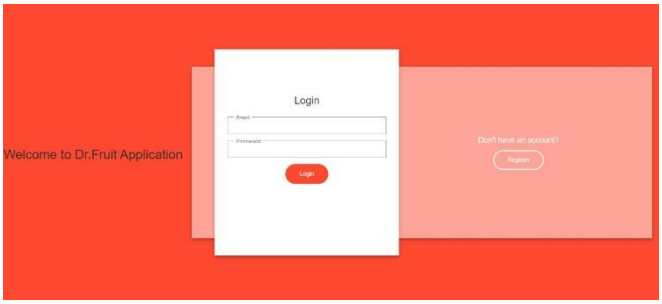

Figure2. Login/Signup Page

In figure 3 shows the Home page consisting of description of proposed system features and user manual.

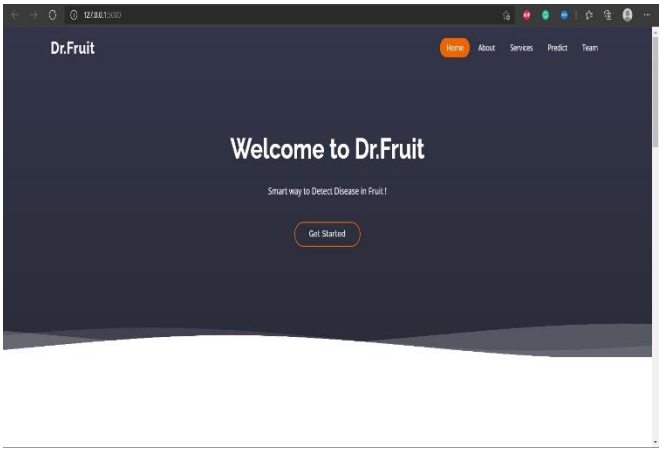

Figure3. Home page

In figure 4 shows the description page where user can have a set of instruction a small information about the System.

Figure4. Description page

In figure 5 shows the prediction page where user can upload the input image and analyse the disease in fruits.

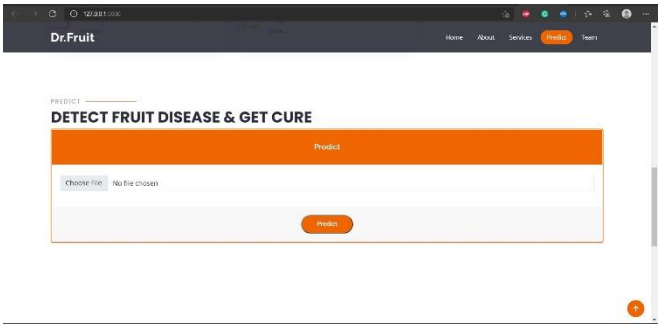

Figure5. Prediction Page.

In figure 6 shows the selection page of input image by user for providing to proposed system.

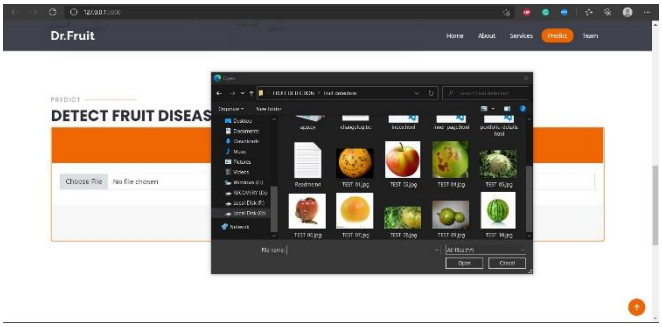

Figure6. Input Selection Page

In figure 7 shows the final prediction result obtained for user input and it suggests cures including chemical and natural cure and with accuracy rate.

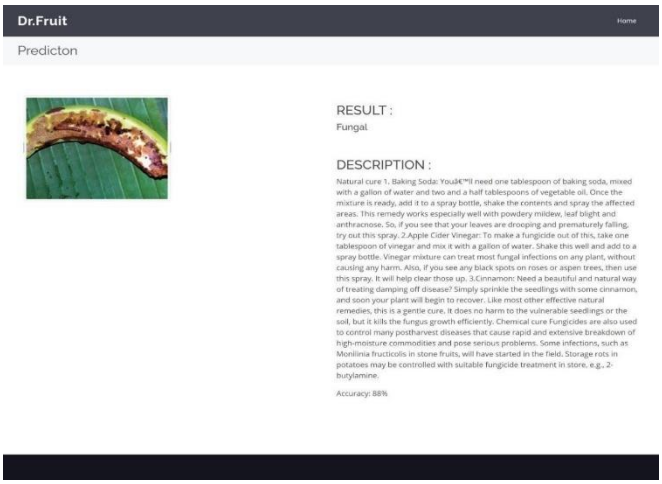

Figure7. Output page

V. CONCLUSION

An Machine learning based solution is proposed and evaluated in this paper for the detection and classification of fruit diseases. This paper presents the innovative methods to detect diseases in fruits and is also a prototype in implementation of the usage of modern technology in agriculture, especially in cash crops. The disease is detected in a very cheap and fast wayIt would also promote Indian Farmers to do smart farming which helps to take time to time decisions which also save time and reduce loss of fruit due to diseases. The leading objective of our paper is to enhance the value of fruit disease detection.

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