



Detection and Classification of Fungal Disease in Fruits Using Image Processing Techniques

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1. INTRODUCTION

The studies of fruit or plant can be determined by observable patterns of specific plant and it is critical to monitor health and detect disease within a plant. Through proper management strategies such as pesticides, fungicides and chemical applications one can facilitate control of diseases which in turn improve quality. There are various techniques available such as spectroscopic and imaging technology, applied to achieve superior plant disease control and management. [1] With smart farming today's farmer can use decision tools and automation techniques which seamlessly integrate product, knowledge and services for better productivity, grading and surplus yield. The purpose of this paper is to monitor diseases on fruits and suggest better solution for healthy yield and productivity with the help of Artificial Neural Network concept. System uses two image databases, one for training of already stored infected area image and other for execution of query images

The pomegranate *Punica granatum* L. belongs to the family Punicaceae. It is cultivated in home gardens especially as a medicinal plant and as a fruit tree. There is no other fruit crop that has high medicinal value compared to that in pomegranate. This nutrient dense, antioxidant rich fruit has been revered as a symbol of health, fertility and eternal life. The Pomegranate gets some of the major diseases, which destroys the fruits and trees resulting in less yield and loss to farmers. Some of the diseases that affect the Pomegranate are *Alternaria alternata*, Anthracnose, Bacterial blight, and *Cercospora* fruit spot. In India, at present the crop disease detection is done by some domain expert and this disease detection is done manually. So it may be time consuming to detect disease on crop and provide proper treatment to prevent economical loss. In this project, we proposed automatic fruit disease detection system using image processing. We have selected pomegranate leaf for automatic disease detection. This fruit is mainly affected now days by the attack of *Alternaria alternata*, Anthracnose, Bacterial blight, and *Cercospora* disease which lead to the major loss for the farmers. The production of pomegranate fruit is taken in the low rain region and which gives the more profit to the farmers. The disease can be widely spread in rainy and winter season. These diseases affect stem, leaf and fruits. The leaf disease in the form of dark brown surrounded by dark yellow, infected leaves turn in yellow color. There is need to identify these diseases at the primary stage to prevent loss to the farmers.

India is the agricultural land, India produces 44.04 million tons of fruit and it is a second largest producer of fruits. India contributes 10% in world fruit production. Indian farmers grow variety of fruits those are apple, banana, citrus, grape, mango, guava, papaya, watermelon. Fruit industry contributes around 20% of the country's development. Production of quality fruits has been decreased because of disgraceful development of fruit, absence of upkeep, and manual assessment. Quantity and nature of the agricultural items are decreased by disease of fruits. The main causes for fruit diseases are viruses and bacteria. The diseases are also caused by bad environmental conditions. There are numerous characteristics and behaviors of such fruit diseases in which many of them are less distinguishable. The diagnosis of fruit disease is important.

2. PROBLEM IDENTIFICATION

In country like India, agriculture is the backbone of the overall GDP. Horticulture has become one of the important source of economy for the country and even the farmers. Farmers will face much losses because of the not identifying the diseases at early stage. Relying on pure naked-eye observation to detect and classify diseases can be expensive for various plant diseases such as Pomegranate. It poses a great threat to the agricultural sector by reducing the life of the plants. In Agriculture field also image processing plays a very important role in identifying any disease of the plant or in grading of the quality of the fruit. Identification of the plant diseases is the key to preventing the losses in the yield and quantity of the agricultural product.

Fruit horticulture is the backbone of agriculture development of any country. The quality of fruit is decided by two factors, one is the weight, nutrients and another one is detection of diseases. Fruit diseases or fruit plant diseases cause major production and economic losses in agriculture industries. In India according to survey of APEDA & DGCIIS annual report nearly 5 lacks tones pomegranate production takes place where as in total state Maharashtra is the most leading state in production of pomegranate.

3.METHODOLOGY

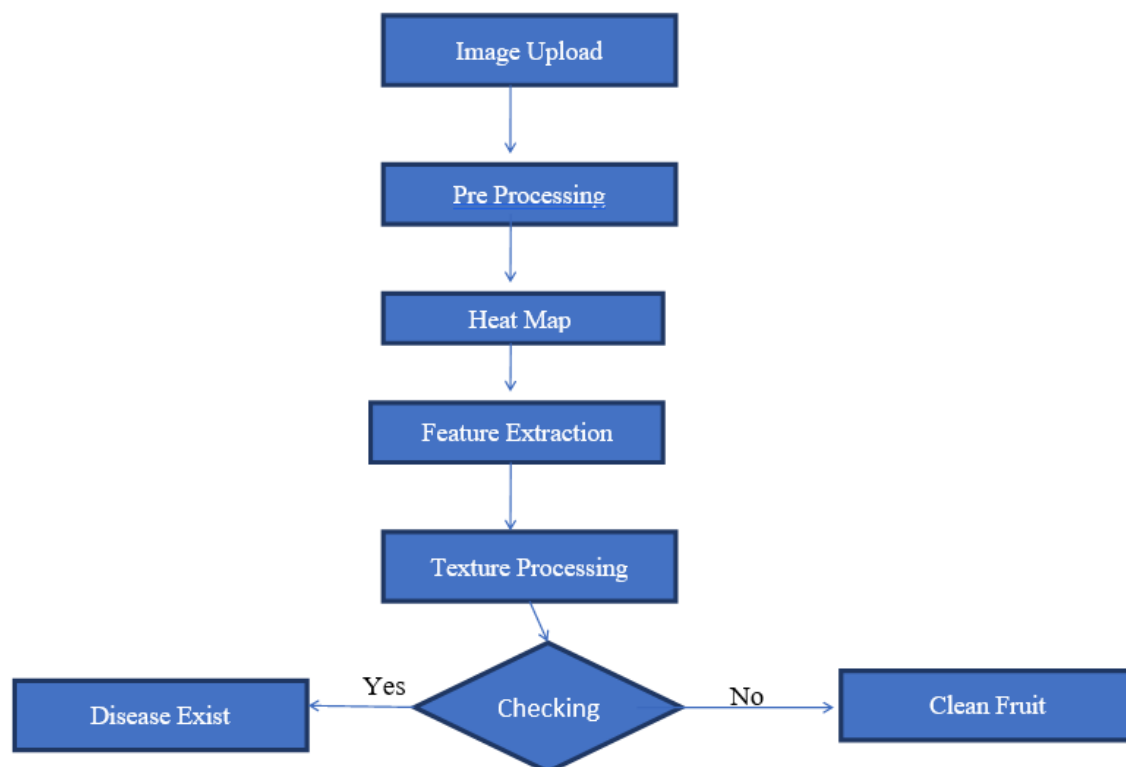
The purpose of proposed system is to supervised the diseases on fruit and suggest alternate solution for healthy yield and good productivity. Labeling of border pixel can be achieved by image segmentation this can be done by K-Means clustering technique. Trained database of infected image has been generated using Neural Network. Feature vectors such as image color, morphology, texture and structure of hole are applied for extracting features of each image and for diagnosis of disease morphology gives accurate result. SURF algorithm used as locator and descriptor for extracting the features. Using extracted features Scope of Interest can be calculated and extraction can be followed as its first step after which refinement and analysis is done. Family of Artificial Neural Network is inspired by biological Neural Networks which is used to evaluate or appraisal functions that depends upon huge number of inputs and they are generally unknown. They are systems of interdependent "neurons" and utilities from inputs for computing and are having a potential of machine learning along with pattern recognition in adaptive nature. This is convenient technique which reduces human effort and gives 90% accurate result. For starting this process, initially non-uniform weights are fixed and then training begins. Supervised and unsupervised are two methodologies used for training. Supervised training mechanism provides the network with the specific output either by manually "grading" the network's performance or by providing the desired outputs accomplished by the inputs while Individual training can be achieved by network that takes inputs without external help. Supervised training approach is used by bulk of networks whereas unsupervised training is applied to execute some initial characteristics on inputs. Basically database server is used for comparison of extracted image with trained database which in turns diagnose and classify disease of fruits.

4. SYSTEM DESIGN

System Design is the next development stage where the overall architecture of the desired system is decided. The system is organized as a set of sub systems interacting with each other. While designing the system as a set of interacting subsystems, the analyst takes care of specifications as observed in system analysis as well as what is required out of the new system by the end user.

As the basic philosophy of Object-Oriented method of system analysis is to perceive the system as a set of interacting objects, a bigger system may also be seen as a set of interacting smaller subsystems that in turn are composed of a set of interacting objects. While designing the system, the stress lies on the objects comprising the system and not on the processes being carried out in the system as in the case of traditional Waterfall Model where the processes form the important part of the system.

Data Flow Diagram:



5. CONCLUSION

The accurately detection and classification of the plant disease is very important for the successful cultivation of crop and this can be done using image processing. This paper discussed various techniques to segment the disease part of the plant. This paper also discussed some Feature extraction and classification techniques to extract the features of infected leaf and the classification of plant diseases. The use of ANN methods for classification of disease in plants such as self organizing feature map, back propagation algorithm, SVMs etc. can be efficiently used. From these methods, we can accurately identify and classify various plant diseases using image processing techniques.

The given system can also be used with the help of the machine learning module which may enhance the accuracy and effectiveness of finding the disease in fruits .

6. References

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