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**BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS),**

**BAGALKOT-587 102**



**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

**For the academic year**

**2019-2020**

#### Project Phase-I Report

**on**

**“FRUIT DISEASE DETECTION AND CLASSIFICATION”**

Guide Project Coordinator Head of the Department

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**CERTIFICATE**

This is to certify that **Ms. ANKITA H(2BA16CS004), Mr. KIRANKUMAR M(2BA16CS022), Mr. NAGARAJ M(2BA16CS030), Ms. PRIYANKA W (2BA16CS042),** has satisfactorily completed the project phase-I on “**FRUIT DISEASE DETECTION AND CLASSIFICATION”,** for the fulfillment of their courses in Computer Science in engineering as prescribed by Basaveshwar Engineering College(Autonomous), Bagalkot during the academic year 2019-2020.

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**ABSTRACT**

Rural field assumptions are an essential part in the improvement of India. Shrewd cultivating is about enabling today’s agriculturists with the choice devices and robotization advances that consistently coordinate items, information and administrations for better efficiency, quality and benefit. The present work proposes a strategy for identifying the diverse sorts of fruit infections early and precisely utilising different methods such as KNN, PNN and SVM. The proposed framework is an effective module that recognizes different sickness of fruits products and decides the stage of infection. The framework utilizes different machine learning methods. At in the first place, the pictures captured are prepared for improvement. Later, picture components, for example, shape, shading and surface are removed for the disease spots. These resultant elements are then given as a contribution to illness classifier to recognize and grade the diseases. At last, taking into account the phase of the sickness, the treatment counselling module can be setup by looking for horticultural specialists, thereby helping the formers.

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**Chapter 1**

**Introduction**

**Chapter 1**

**Introduction**

**1.1 Project overview**

The classical approach for detection and identification of fruit diseases is based on the naked eye observation by the experts. In some developing countries, consulting experts are expensive and time consuming due to the distant locations of their availability. Automatic detection of fruit diseases is essential to automatically detect the symptoms of diseases as early as they appear on the growing fruits. Fruit diseases can cause major losses in yield and quality appeared in harvesting. To know what control factors to take next year to avoid losses, it is crucial to recognize what is being observed. Some disease also infects other areas of the tree causing diseases of twigs, leaves, and branches.

**1.2 Objectives**

* The primary goal of this proposed strategy is to enhance the effectiveness and efficiency through a robust system which can beat the deficiencies of the instructions manual procedure.
* Approach to automatically detect the disease and giving proper solution to it for diseased fruit.
* Bacterial blight disease is also identified on pomegranate fruit. If the disease is identified then the proper solution advisory can be given to prevent the further losses.

**1.3 Purpose**

The increase in amount of commercialization, agricultural farms are always on the look out to 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 can be custom made to be suitable for other applications such as disease detection, maturity detection, tree yield monitoring and other similar operations. This system takes input as image of fruit and identifies it as infected or non-infected. The technique helps the farmers to identify disease properly.

**1.4 Scope of the work**

In numerous nations, the pomegranate which is a conventional harvest, or another product, needs more interest in innovative work. With the specific end goal to construct the information in light of sound ground, such as the requirements for treating, watering the system and for other green practices. Well disposed plant insurance hones must be created, as the business sectors request cleaner (from pesticides) fruits, than it gets today. Models of value are required in the business sectors. Participation in exploration, improvement and trade of the current learning are a portion of the initial moves towards better creation and items.

**1.5 Applicability**

1. It would 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.
2. Automatic detection of fruit diseases is environmental damage reduction.
3. Customers can be able to determine the quality of fruits by using this application so that they can easily purchase the good fruits.
4. The increased in amount of commercialisation agricultural farms are always on the look out to reduce man power in whatever way possible without affecting the productivity.

**Chapter 2**

**Literature Survey**

**Chapter 2**

**Literature Survey**

**2.1Summary**

Topic detection is the major area which takes the problem of discovering events which are most interest to the crowd. Over the past years, different disease detection techniques have been proposed.

1. Tejas Deshpande (2014) proposed an “automatic grading of disease on the pomegranate plant leaves**”**. Bacterial blight disease is chosen for the research work. Manual grading is time consuming so automatic grading system becomes beneficial. K- means clustering technique is used to conduct the image dividing technique and disease recognization. Total leaf area (At) and total disease area (Ad) is calculated. After calculating At and Ad, disease grading has been done [1].
2. This system is useful for plant pathologists and not for the farmers directly. In [2] Jhuria and Kumar (2013) suggested an image processing approach for recognization of diseased fruit to grade it. The main goal of this proposed work is to analyze disease for fruit/leaf of fruits and provide alternative solutions. The work has done on fruits namely Apple and grapes. Image processing techniques are used for fruit disease detection and for calculation of weight of fruit. Colour, Texture and morphological descriptors are considered for image description. Artificial Neural network is used for image classification. Back propagation procedure is utilized for changing the weight of images put away in preparing database. The evaluation of fruit is settling on the premise of disease distribution and weight of fruit.
3. In [ 3], Pujari et al. (2014) used some statistical methods for detecting fruit fungal disease. Thefruits chosen for research work are namely Pomegranate, mango and grapes. Two phases are used for image preprocessing. In first phase, input image is preprocessed for binarization and noise removal. In second phase image is thinned and bounding box is generated. Block wise feature extraction technique is used for feature extraction. In this technique image is divided in 5\*5 blocks. The GLCM (gray level co-occurrence matrix) technique is used to extract the textual features.
4. In [4] Shiv Ram Dubey (2012) an image processing approach has been used for fruit disease identification. The main parts of apple fruit are apple scab, apple blotch, and apple rot. All these parts are used for apple disease detection . For dividing the images the “K-means clustering” technique is used. Feature extraction is done from segmented images. Features considered for feature extraction are color histogram, color coherence vector, complete local binary patterns and local binary patterns. For identifying the different types of fruit disease the “Multiclass Support Vector Machine” is used.
5. The author Pertot (2012) provided multilingual web-based tool for visual plant disease identification. The system has 2 users. User who does the disease recognization process which is used for diagnostic and super user who is able to update the system (add/delete/modify images, disease). This system is developed for identification various disease on strawberry. The growers in the field analyze the symptoms for the fruits images which are provided through web based system. The system will give response with recognizing the most probable diseases of fruits [5].
6. Tejal et al. [6] propose a system for disease identification and grading. They have done their work on pomegranate leaf and fruit which detect bacterial blight disease. To remove the shadow, which occurs during image acquisition, morphology technique has been used in pre-processing. For segmentation the author uses the K-means clustering technique. After segmentation AT (Total Area of leaf or fruit) and AD (Total disease area) are calculated. Using AT and AD PI (percent-infection) is calculated, Using PI, grade of the disease is determined. For disease identification they consider two characteristics and for the leaf they check diseased spot and bordered by yellow margin. if yes then it signifies that leaf is infected by bacterial blight and for the fruit first black spots are identified and if crack passing through that black spot it signifies that fruit is infected by bacterial blight. By using proposed system they achieve precise, accurate and acceptable result.
7. Revathi and Hemalatha [7] give a Homogeneous pixel counting technique for cotton disease detection (HPCCDD). Segmentation is done by using edge detection and canny sobel homogeneous methods. Homogeneous pixel counting techniques is applied for cotton disease detection and classification. By using proposed algorithm 98.1% accuracy has been achieved.
8. Monica et al. [8] give a system for disease detection and fruit grading. For feature extraction three feature vectors have been used , namely, color, texture and morphology in which morphology gives an accurate result. For the classification, artificial neural network has been used. For the fruit grading, two methods are used spread of disease and automated calculation of mango weight. To calculate the percent of diseases affected in the fruit the K-means clustering is used and in second method by using number of pixel weight is calculated and as per the weight quality of the fruit is decided.
9. Ratnasari et al. [9] proposed a system for sugarcane leaf disease recognization. Proposed system has been verified only on three diseases, namely, rust spot, ring spot and yellow spot. Total 30 testing data are taken in which 9 images with rust disease, 7 images with circle dot disease, and 14 images with yellow dot disease. In feature extraction combination of color and texture feature has been used while for classification SVM classifier is used. In SVM classifier different kinds of kernel are tested, namely, linear, quadratic, radial basis function, and polynomial with 3rd  order in which linear kernel give better result than other. But because of limitation of segmentation method only 80% accuracy has been achieved.
10. Asho and Vinod [10] proposed a system for quality evaluation of fruits which is based on neural network. Experimental results display different accuracy levels of disease detection based on the input image quality and the stages of the disease. The overall system accuracy is measured to be 82%. Thus, this system takes one step towards promoting the farmers to do the smart farming and allowing them to take decisions for a better yield by making them capable to take the necessary preventive, corrective action on their pomegranate crop. In future, the system can be improved with the new features incorporated as- training the system to detect diseases for other fruits, increase dataset size to improve the overall system performance to detect diseases more accurately
11. Bashish et al. [11] proposed a outline for detection and classification of leaf diseases and stem diseases. Solution of the system tested on five diseases which are: Early scorch, tiny whiteness, ashen mold, late scorch, and Cottony mold. First color transformation is conducted. Then, K-means clustering is used for segmentation. Color Co-occurrence method has been used for feature extraction in which color and texture feature are considered. Neural network classifier is used for classification which is based on statistical classification.
12. Rastogi et al. [12] has done an image processing and machine vision based technology for leaf disease detection and grading. First pre-processing has been done on leaf images then segmentation is applied by using K-means clustering and Euclidean distance technique. In feature extraction GLCM matrix is considered in which contrast, energy, homogeneity, and correlation have been calculated. Artificial neural network has been used for the classification. For grading percentage infection has been calculated by using total leaf area (AT) and diseased area (AD). After calculating the percentage infection grading has been applied by using fuzzy logic.
13. In paper [13] provides a detailed literature review and gives an idea that what has been done till now and what is the scope of current research for the image categorization problems. Image processing based approach composed of the following steps is used; in the first step the proposed approach would be using clustering technique for image segmentation which is followed by extraction of some features from the segmented image and finally images are classified into one of the classes.
14. This paper [14] reviews and summarizes various techniques of plant disease detection using image processing that have been used by a number of researchers in the past few years. The major techniques employed were: BPNN, SVM, K-means clustering, Otsu’s algorithm, CCM and SGDM. These techniques are used to detect if the leaves are healthy or diseased. Various challenges arise in this process including the automation of the detection system using complex images captured in outdoor lightning and intense environmental conditions. This review paper concludes that these disease detection techniques show a efficiency and accuracy such that they have the ability to run the system developed for detection of leaf diseases besides having some limitations. Therefore, there is a lot that can still be done in this field for enhancement of the existing works.
15. In [15] paper conclude different segmentation, feature extraction and classification techniques for plant disease detection using its leaf or fruit. Each and every technique has some merit and demerits. Based on requirement we have to use method for that. Here they had seen different segmentation techniques with its merits and demerits no such segmentation technique applicable in all images so use any of technique which is suitable for our application. Also seen different classification techniques with its merit and demerits. Among different classifier ANN and SVM give better accuracy then other classifier.
16. In paper [16] an image processing based solution is proposed and evaluated in this paper for the detection and classification of apple fruit diseases. The proposed approach is composed of mainly three steps. In the first step, image segmentation is performed using K-Means clustering technique. In the second step, features are extracted. In the third step training and classification are performed on KNN classifier. They have used three types of apple diseases namely: Apple Blotch, Apple Rot, and Apple Scab as a case study and evaluated our program. Experimental results showed the apple fruit disease recognition rate of the algorithm can reach more than 99.6%. It proved that the KNN classifier could effectively recognize the apple disease of apple scab, apple rot and apple blotch.
17. In paper [17] in Fruit Detection System we had analyzed that the proposed technique based on fuzzification in which fuzzy curves and fuzzy surfaces rapidly find the feature for pattern recognition system. Fuzzy surfaces remove those features that are based on other significant features. It had proved for providing good results in feature extraction. K-mean clustering algorithm had proved to be the one of the best techniques for segmentation. SVM had proved to be best for classification as it maps input data with high dimensional feature space through linear or non-linear mapping techniques. When the quality of image is low or the resolution of image is low Intent Search Technique had proved to be best for improving the quality of image.
18. In paper [18] an image processing based solution is proposed and evaluated in this paper for the detection and classification of fruit diseases. The proposed approach is composed of mainly three steps. In the first step image segmentation is performed using K-Means clustering technique. In the second step features are extracted. In the third step training and classification are performed on a SVM. It 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.
19. In paper[19] Smart Farming: Pomegranate Disease Detection Using Image Processing. In this paper, a Web based Image Processing dependent approach for the Bacterial Blight (“Telya”) disease for Pomegranate fruit is proposed. The input image is first pre-processed, then its features are extracted on three parameters namely- color, morphology, and CCV then, training and classification of the same are done. The proposed system provides two methods for the user to check the disease infection for the input pomegranate image as- with intent search and without intent search.
20. Asho and Vinod [10] proposed a system for quality evaluation of fruits which is based on neural network. In proposed system test has been done on apple fruit. Total 65 data has been taken for testing in which 20 images are from healthy fruit and 5 images are from diseased fruit. YCbCr color space method has been used for the segmentation. Various features are extracted in feature extraction method. Probabilistic Neural Network has been used as a classifier.

**2.2 Issues And Challenges**

After performing literature review a few of the challenges and issues are identified. These challenges are enlisted in the following.

1. **Illumination of light:** In the identification of fruit disease detection, image does not have the same level of illumination amount. It is varying in light illumination condition. Need to require the more time for processing.
2. **Mixed diseases:** Fruit image, in single field different type of diseases are grown. This is not easy to identify the more than one fruit in the field so future scope is needed to identify the mixed diseases.
3. **Image Quality:** This is also one issue for getting good result. If high resolution image then processing time required will be more compared to the low resolution of the image. If image quality is good, more accurate result can be achieved.
4. **Overlapped Images:** In various fields, disease are not same to all fruits so different fruits can have more than one diseases hence may cause problem for detecting the diseases.
5. **Computation time:**  It is the one of the main issue for classifying the diseases of any real time system to reduce the computation time this is foremost needed to reduce the computation time.
6. **Climatic condition:** This is one of the foremost challenges to detecting the disease. In agriculture field diseases are in different weather situation, here if it is in different climatic situation like sunny day, a rainy day, cloudy, it is not easy to detect t the diseases.

**Chapter 3**

**Requirements and Specification**

**Chapter 3**

**Requirements And Specification**

**3.1 Problem Definition**

In India, at present the fruit 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 fruit and provide proper treatment to prevent economical loss. We have proposed automatic fruit disease detection system. Agriculturists experience great troubles in changing starting with one disease control strategy then on to the next. Depending on unadulterated necked eye perception to identify and characterize sickness can be costly different fruit disease represent an awesome risk to the agricultural segment by diminishing the life of the fruits.

**3.2 Motivation**

Recognition of disease and classifying the diseases using fruits image by digital image processing technique plays an important role in finding the appropriate solution for the particular disease. In practice the exposed eye perception is the primary methodology which was embraced and this approach requires uninterrupted monitoring of leaf/flower image of plant by expert which may be costly in large farm. In some developed nations, agriculturists should go far distance to get knowledge and information from the experts. But this is very expensive and time consuming.

The solution which is depending on an image on an image processing is proposed to recognize the fruit disease. Bacterial blight disease is identified on pomegranate fruit and leaf. If the disease is recognized then the accurate solutions will be suggested to the agriculturists. The proposed system consists of pre-processing, segmentation, image descriptors, training and classification. This system will provide immediate solution to farmers which is time saving and also it reduces the loss of fruits which are affected. The main motivation behind this method is used to enhance the effectiveness of fruit disease recognization system by adding Internet Search technique.

**3.3 BLOCK DIAGRAM OF THE PROPOSED SOLUTION**

|  |
| --- |
| **Acquiring fruit images database** |

|  |
| --- |
| **Pre-processing** |

|  |
| --- |
| **Feature extraction** |

|  |
| --- |
| **Classification** |

|  |
| --- |
| **Fruit disease detection and classification** |

**Fig. 1 Proposed Block Diagram**

**DESCRIPTION**

Initially the images of fruits are improved, partitioned and features are extracted from image. The features selected are given as input to classifiers for disease detection and classification. The shape features of fruits such as major axes, minor axes, aspect ratio and area are extracted. The color features of fruits are extracted. All the extracted features are trained by using classifiers. The **Fig.1** describes the proposed methodology.

The proposed methodology follows 2 phases for the classification and recognition of disease using fruit images such as:

1. Training Phase
2. Testing Phase

The work takes an input image of diseased fruit. After accepting the image the pre-processing over the fruit image is carried out by resizing the size of an input image and filtering of the resized image using Gaussian filter technique is done. In the segmentation the edge-based segmentation is done and techniques are used to get an edge of an input image. After getting region of interest from an input fruit image, feature extraction step is carried out to extract the feature(area, colour and shape). The extracted features are stored in a knowledge base for future retrieval.

Training, testing and validation are performed using fruit sample images. The colour, shape and area feature sets are combined to perform a combined feature set that consist of input features. In recognition and classification step the result will be displayed by analyzing the feature set. The result is classified as the name of disease as results, symptoms and classification.

**3.4 Software and Hardware Requirements**

**Software Requirements:**

* MATLAB latest version

A use of MATLAB includes:

* Math and Computation.
* Algorithm development.
* Modelling, simulation and prototyping.
* Data analysis, exploring and visualization.
* Scientific and Engineering graphics.
* Application development including GUI building.

**Hardware Requirements:**

* Pentium-8
* Hard disk 1 Tb

**Chapter 4**

**Conclusion**

**Chapter 4**

#### CONCLUSION

#### Fruit disease detection and classification help us in removing the diseased fruits from the field as well as knowing it’s harmfulness and other information. The main aim of this project is to identify the different type of fruit diseases and display the appropriate information about the fruit. Image processing techniques are used to identify and classify the diseased fruits. Fruit disease can be removed at the earliest stage only. The major image processing steps used for the detection of diseased fruits are preprocessing, feature extraction and classification using KNN classifier. This system is helpful for farmers in identifying the diseased fruits and knowing more about the diseases. Future scope of this project is to detect and remove the diseased fruits under the variation of illumination.

**Chapter 5**

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**Chapter 5**

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