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LEAF DISEASE DETECTION USING OPENCV

Parshw Lande*1, Vivek Patil*2, Soham Mali*3, Prathmesh Murchite*4

*1,2,3,4Student, Department Of Computer Engineering, Sharad Institute Of Technology, Polytechnic (SITP), Kolhapur, India.

ABSTRACT

Plant diseases affect the growth and crop yield of the plants and make social, ecological and economical impacts on agriculture. Recent studies on leaf diseases show how they harm the plants. Plant leaf diseases also cause significant economic losses to farmers. Early detection of the diseases deserve special attention. Plant diseases are studied in the literature, mostly focusing on the biological aspects. They make predictions according to the visible surface of plants and leaves. Detection of diseases as soon as they appear is a vital step for effective disease management. The detection is traditionally carried out by human experts. Human experts identify diseases visually but they faces some difficulties that may harm their efforts. In this context, detecting and classifying diseases in an exact and timely manner is of the great importance.

The early detection of diseases is important in agriculture for an efficient crop yield. The bacterial spot, late blight, septoria leaf spot and yellow curved leaf diseases affect the crop quality of tomatoes. Automatic methods for classification of plant diseases also help taking action after detecting the symptoms of leaf diseases. This paper presents a Convolutional Neural Network (CNN) model and Learning Vector Quantization (LVQ) algorithm based method for tomato leaf disease detection and classification. The dataset contains 500 images of tomato leaves with four symptoms of diseases. We have modeled a CNN for automatic feature extraction and classification. Color information is actively used for plant leaf disease researches. In our model, the filters are applied to three channels based on RGB components. The LVQ has been fed with the output feature vector of convolution part for training the network. The experimental results validate that the proposed method effectively recognizes four different types of tomato leaf diseases.

In this, Most content-based image retrievals (CBIR) use color as image features. However, image retrieval using color features often gives disappointing results because in many cases, images with similar colors do not have similar content. Color methods incorporating spatial information have been proposed to solve this problem.

Keywords: Leaf, Disease, Leaf Detection, Opencv, Image Processing, Convolutional Neural Network, Features Extraction, Classification Etc.

I. INTRODUCTION

Identification of the plant diseases is the key to preventing the losses in the yield and quantity of the agricultural product. The studies of the plant diseases mean the studies of visually observable patterns seen on the plant. Health monitoring and disease detection on plant is very critical for sustainable agriculture. It is very difficult to monitor the plant diseases manually. It requires tremendous amount of work, expertize in the plant diseases, and also require the excessive processing time. Hence, image processing and Machine learning techniques are used for the detection of plant diseases. Disease detection involves the steps like image acquisition, image pre-processing, image segmentation, feature extraction and classification.

This paper introduces Advances in artificial intelligence researches now make it possible to make automatic plant disease detection from raw images . Deep learning can be thought as a learning method on neural networks. One of the advantages of deep learning is that it can extract features from images automatically. The neural network learns how to extract features while training. CNN is a multi-layer feed-forward neural network and is the popular deep learning model.

1.1 Basic Idea

For increasing growth and productivity of crop field, farmers need automatic monitoring of disease of plants instead of manual. Manual monitoring of disease do not give satisfactory result as naked eye observation is old method requires more time for disease recognition also need expert hence it is non effective. So in this, we introduced a modern technique to find out disease related to both leaf and fruit. To overcome disadvantages of traditional eye observing technique, we used digital image processing technique for fast and accurate disease

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detection of plant. In our proposed work, we developed k-means clustering algorithm with multi SVM algorithm in MATLAB software for disease identification and classification.

The old and classical approach for detection and recognition of plant diseases is based on naked eye observation, which is very slow method also gives less accuracy. In some countries, consulting experts to find out plant disease is expensive and time consuming due to availability of expert. Irregular check up of plant results in growing of various diseases on plant which requires more chemicals to cure it also these chemicals are toxic to other animals, insects and birds which are helpful for agriculture. Automatic detection of plant diseases is essential to detect the symptoms of diseases in early stages when they appear on the growing leaf and fruit of plant .

1.2 Need of Project

Images convey relevant data and information in biological sciences. Digital image processing and the image analysis technology have a vital role in biology and agricultural sectors. Automatic detection of plant diseases and cultivation of healthy plants is of great importance and agricultural automation. The case of a plant, the term disease is defined as any impairment happening to the normal physiological function, producing characteristic symptoms. The studies of plant diseases refer to studying the visually observable patterns of a particular plant. The identification of plants, leaves, stems and finding out the pests or diseases, or its percentage is found very effective in the successful cultivation of crops. The naked eye observation is the approach adopted by many of the farmers for the detection and identification of plant diseases.

It requires continuous monitoring and found less useful on large farms. Also, the farmers are unaware of non-native diseases. With the aid of imaging technology the plant disease detection systems automatically detect the symptoms that appear on the leaves and stem of a plant and helps in cultivating healthy plants in a farm. These systems monitor the plant such as leaves and stem and any variation observed from its characteristic features, variation will be automatically identified and also will be informed to the user. This paper provides an evaluative study on the existing disease detection systems in plants.

1.3 Image Processing

Image processing is any form of processing for which the input is an image or a series of images or videos, such as photographs or frames of video. The output of image processing can be either an image or a set of characteristics or parameters related to the image. It also means "Analysing and manipulating images with a computer". Image processing is performed this three steps :

1. First, import images with an optical devices like a scanner or a camera or directly through digital processing.

2. Second, manipulate or analyse the images in some way. This step can includeimage improvement and data summary, or the images are analysed to find rules that aren't seen by the human eyes. For example, meteorologists use this processing to analyse satellite photographs.

3. Last, output the result of image processing. The result might be the image changed by some way or it might be a report based on analysis or result of the images.

1.4 Objective of project

- To implement leaf diseases detection with improvement accuracy.
- Segmentation of diseases part of leaf
- To get the processed leaf image as an input.
- To segment the image using K-Means clustering algorithm.
- Finally provide the type of disease attacked in the leaf using SVM classifier and severity level.

II. LITERATURE SURVEY

Describe the identification of various leaf diseases as illustrated and dissuced below. An identification of variety of leaf diseases using various data mining technique is the potential research area. The diseases of different plant species has mentioned . Classification is done for few of the diseases names in this system.

This find out the computer system which analyzed the input images using the RGB pixel counting values features used and identify disease wise and next using homogenization techniques , sobel and canny using edge

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detection to identify the affected part of the leaf spot to recognize the diseases boundary is white lighting and then result is recognition of the diseases as output . Describes an approach for disease detection of crop for economic growth of rural area. This paper discussed about an automated system for identifying and classifying different diseases of the contaminated plants is an emerging research area in precision agriculture. This paper describes the approach to prevent the crop from heavy loss by careful detection of diseases. The region of internet is leaf because most of the diseases occur in leaf only. Histogram equalization is used to pre-process the input image to increase the contrast in low contrast image, K-mean clustering algorithm which classifies objects. Disease in crop leaf are detected accurately using image processing technique it is used to analyse the disease which will be useful to farmers.

III. METHODOLOGY

A. Input Image:

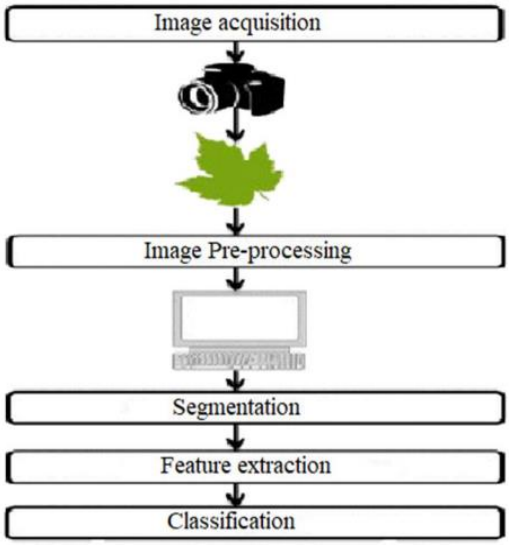
In this we can input image as camera access and also insert images form the local disk . We used digital leaf images to identify diseases. The images were taken from different online sources. There are three common rose diseases that we used in this research, i.e., Black spot, Anthracnose and Rust .

B. Image Pre-processing:

Image pre-process tasks are the initial stage before feature extraction. There are three steps of image preprocessing processing, i.e., image cropping, image converting and image enhancement. The image is cropped on leaf diseases area, and then converted to gray levels. To enhance the image we used Laplacian filter.

C. Image Segmentation:

Image segmentation is one of the most important precursors for disease detection and has a crucial impact on the overall performance of the developed systems. The K-Means clustering technique is a well-known approach that has been applied to solve low-level image segmentation tasks. This clustering algorithm is convergent and its aim is to optimize the partitioning decisions based on a user-defined initial set of clusters



D. Feature Extraction:

Proposed method include two features color texture and space features. These features are total 17 in numbers including 13 color features and 4 shape features. Shape features including area, perimeter, circularity and complexity were extracted from the binary segmentation images. Color features and texture features were extracted from the color segmentation image. The image analysis technique is done using Color Co-occurrence Matrix.

Proposed Methodology and Action Plan

Problem Framing (24/09/2023 - 01/10/2023): In this initial phase, we begin by framing the core challenges existing in the art market concerning authenticity, provenance, and trust. Through a comprehensive analysis of industry pain points, we aim to outline a clear problem statement.

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Literature Synthesis (02/10/2023 - 08/10/2023): A thorough literature synthesis forms the foundation for our project. By examining existing research and Disease detection solutions within art markets, we'll discern valuable insights and established practices.

Requirements Elicitation (09/10/2023 - 15/10/2023): The requirements elicitation phase involves extensive collaboration with stakeholders, encompassing art market experts, artists, collectors, and third-party marketplace representatives. The objective is to elicit comprehensive and granular requirements to drive system design.

Architecture Design (16/10/2023 - 29/10/2023):

This phase focuses on the development of Leaf disease detection architectural framework and enhance the given input image by Image acquisition and Image pre□processing The design reflects a harmonious blend of security and usability.

Platform Development and Integration (30/10/2023 - 19/11/2023): With meticulous attention to detail, the platform development phase materializes Leaf detection. Simultaneously, we undertake the integration process with

Our project team member.

Testing and Debugging (20/11/2023 - 29/11/2023): Rigorous testing and debugging form the linchpin of quality assurance. Our dedicated quality control team ensures the system functions seamlessly, adhering to stringent standards.

Deployment, User Training, and Transition (30/11/2023 - 12/12/2023): As the project culminates, we orchestrate the deployment of Leaf detection using openCV, complemented by comprehensive user training programs .

Monitoring and Evaluation (From 13/12/2023): The post-implementation phase initiates a continuous monitoring system for performance, security, and efficiency. User feedback is meticulously collected and analyzed for ongoing enhancements.

Documentation and Knowledge Transfer (20/12/2023): The project wraps up with a focus on documentation preparation and structured knowledge transfer to empower the client or designated organization.

Report Generation and Data Analysis (20/12/2023): A comprehensive project report is generated, highlighting implementation details, challenges faced, and outcomes. Data analysis quantifies impact on Leaf disease detection .

Action Plan

Phase 1: Problem Framing and Literature Synthesis

Step 1: Problem Framing

Step 2: Literature Synthesis

Phase 2: Requirements Elicitation and Design

Step 3: Requirements Elicitation

Step 4: Architecture Design .

Phase 3: Platform Development, Integration, and Testing

Step 5: Platform Development and Integration

Step 6: Testing and Debugging

Phase 4: Deployment, Training, and User Transition

Step 7: Deployment

Step 8: User Training and Transition

Phase 5: Monitoring, Evaluation, and Knowledge Transfer

Step 9: Monitoring and Evaluation

Step 10: Documentation and Knowledge Transfer

Phase 6: Reporting and Analysis

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Step 11: Report Generation

Step 12: Data Analysis

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IV. FUTURE SCOPE

The method reported in the thesis can be used to design a soya bean expert system for farmers for the early detection of plant foliar infection, infection grading and getting the appropriate cure remotely. Through the thesis work, we have tried to highlight the problems associated with the cultivation of soybean and causes of low yield loss in the developing countries like India. it has been proposed a fully automatic method for identification and classification by different digital image processing techniques and also to classify the disease severity level using five classes. It has been derived and development various new parameters and indices like DSI, IPR, DLP, which are subsequently used for disease level prediction.

V. CONCLUSION

This paper presents the survey on different diseases classification techniques used for plant leaf disease detection and an algorithm for image segmentation technique that can be used for automatic detection as well as classification of plant leaf diseases later. Banana, beans, jackfruit, lemon, mango, potato, tomato, and sapota are some of those ten species on which we are tested as Experiment of our project. Another advantage of using this method is that the plant diseases can be identified at early stage or the initial stage.

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