International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 12 | December - 2023 SJIF Rating: 8.176 ISSN: 2582-3930

BLACK ROT DISEASE DETECTION IN GRAPE PLANT (VITIS VINIFERA) USING COLOUR BASED SEGMENTATION

P.Harshitha
B.Tech AI&ML
MallaReddy University Hyderabad

P.Saiteja
B.Tech AI&ML
MallaReddy University Hyderabad

P.Saarika
B.Tech AI&ML
MallaReddy University Hyderabad

Dr.Arivazhagan
Professor
MallaReddy University Hyderabad

Abstract : The cultitechniques for the early and accurate detection of Black Rot disease. Our methodology involves the acquisition of high-resolution images of grape leaves and clusters. These images are then subjected to a color-based segmentation process to isolate regions of interest that exhibit symptoms of Black Rot. The results demonstrate the efficacy of the proposed approach. The integration of Color-Based Segmentation and Machine Learning enables accurate and automated identification of Black Rot disease in grape plants. This system holds promise for early disease intervention, enabling growers to take timely actions to mitigate the spread of Black Rot and prevent potential yield vation of Grape Plants (Vitis vinifera) is of significant economic importance, but the prevalence of diseases such as Black Rot poses a serious threat to grape yields and quality. In this study, we propose a novel approach to address this issue by combining Color-Based Segmentation and Machine Learning losses. In conclusion, this study bridges the gap between agricultural practices and modern technology, offering a reliable and efficient tool for Black Rot disease detection. The combination of Color-Based Segmentation and Machine Learning presents a promising avenue for sustainable grape cultivation by aiding in the preservation of grape plant health and overall yield maximization.

I. INTRODUCTION

Grapes (Vitis Vinifera) are one of the most economically important fruit crops globally, serving as the primary raw material for wine production and various other grape-derived products. However, the grape industry faces a significant challenge in the form of various diseases that can adversely affect grapevine health and yield. One such disease is Black Rot, caused by the fungus Guignardia bidwellii. Black Rot can lead to substantial yield losses and a decrease in grape quality, making its early detection and management crucial for grape growers.

Grape diseases like Black Rot have been detected through manual visual inspection, which is labor-intensive, time-consuming, and often prone to errors. In recent years, the integration of advanced technology and machine learning has provided a more efficient and accurate solution for disease detection and management in grape plants.

This project focuses on the development of a robust and automated system for Black Rot disease detection in grape plants using a combination of color-based image segmentation and machine learning techniques.

This approach combines image processing, computer vision, and machine learning to create a powerful tool for grape growers, enabling them to detect Black Rot at an early stage and mitigate its impact on grape production. Such automated systems contribute to more sustainable and efficient vineyard management, ultimately benefiting both the grape industry and consumers.

II. MACHINE LEARNING ALGORITHM

This project uses deep learning techniques, specifically convolutional neural networks (CNNs), for image classification tasks.

- Convolutional Neural Networks (CNNs):

CNNs are a type of deep learning algorithm designed for image processing tasks. They excel at capturing hierarchical features from input images, making them ideal for tasks like image classification.

- Support Vector Machines (SVM):

Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning.

- Random Forest:

Random Forest is an ensemble learning algorithm that combines the outputs of multiple decision trees.

- Gradient Boosting:

Gradient Boosting methods like XGBoost, LightGBM, and CatBoost are powerful ensemble algorithms.

- K-Nearest Neighbors (K-NN):

K-NN is a simple and intuitive algorithm that can be used for classification based on feature vectors.

III. REQUIRED TOOLS:

1. Python
2. Image processing libraries
3. Dataset
4. Data preprocessing Tools
5. Color Segmentation Techniques
6. Model Architecture

IV. DATA COLLECTION:

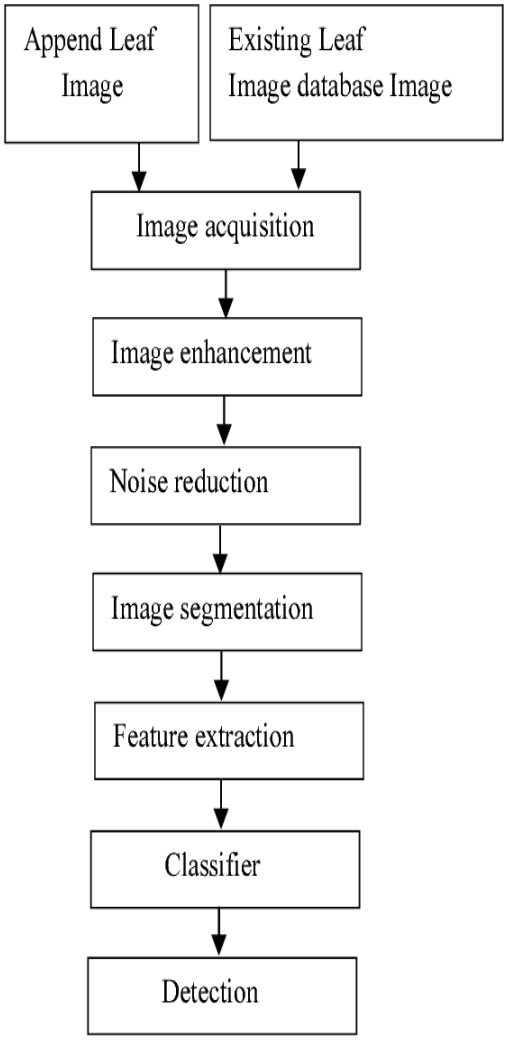
Detecting black rot disease in grape plants using color segmentation and machine learning involves several steps, including data collection, preprocessing, feature extraction, model training, and evaluation.

1. Data Collection:
a. Image Acquisition:
Capture images of grape leaves with black rot disease under various conditions (lighting, angles, etc.).
Use a high-resolution camera or a dataset if available.
b. Image Annotation:
Annotate images to create a labeled dataset. Mark regions affected by black rot disease.
Tools like LabelImg, VGG Image Annotator (VIA), or RectLabel can help with annotation.
2. Data Preprocessing:
a.Data Augmentation:
Augment the dataset by applying transformations like rotation, flipping, and changes in brightness to increase model robustness.
3. Feature Extraction:
a. Color Segmentation:
Use color segmentation techniques to separate diseased regions from healthy ones.
Common techniques include thresholding, clustering (e.g., K-means), or more advanced methods like Watershed segmentation.
4. Model Evaluation:
a. Cross-Validation:
Perform cross-validation to ensure the model's robustness.
b. Testing:
Evaluate the model on a separate test set to assess its performance on unseen data.

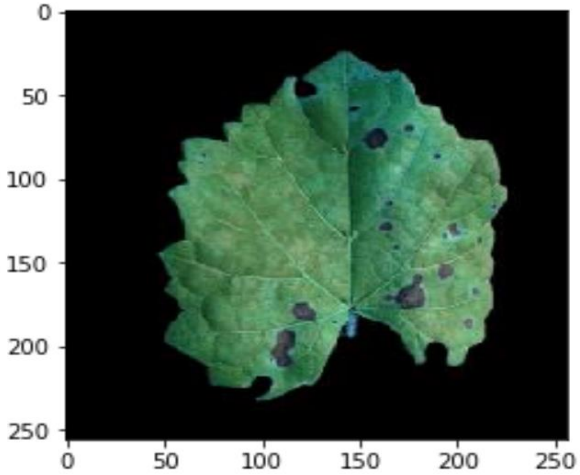
V. METHODS&LIBRARIES:

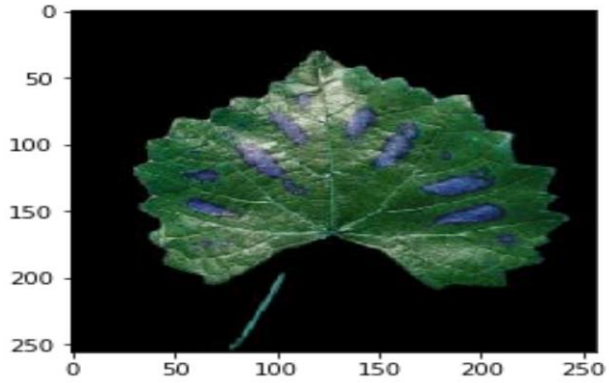
1.Tensorflow: These deep learning frameworks can be employed if you decide to use convolutional neural networks (CNNs) for more complex image recognition tasks.
2.Numpy: : For numerical operations and handling arrays or matrices of pixel values.
3. Pandas: For data manipulation, cleaning, and transformation.
4.Matplotlib or Seaborn: Use these libraries for visualizing the segmented images, model predictions, and evaluation metrics.
5.OpenCv: Utilize OpenCV for image processing tasks, including color segmentation to isolate affected areas.
6.Scikit-learn: Employ Scikit-learn for machine learning tasks, such as classification algorithms, to train a model for detecting Black rot based on segmented images.

VI. ARCHITECTURE:



VII. EXPERIMENT RESULTS:






```
In [34]: categories[predict_class[0]]
Out[34]: 'Esca_(Black_Measles)'

In [1]: categories[predict_class[1]]
        Black Rot
```

VIII. CONCLUSION:

In conclusion, the integration of color-based segmentation and machine learning techniques for black rot disease detection in grape plants represents a promising and effective approach. By leveraging advanced image processing methods, such as color segmentation, we can extract valuable information from images of grape leaves and identify regions affected by black rot disease.

This innovative approach not only improves the speed and accuracy of detection but also allows for early identification of infected plants, potentially minimizing crop losses. Additionally, the automation of the detection process through machine learning reduces the reliance on manual inspection, making it a cost-effective and scalable solution for grape farmers.

In summary, the combination of color-based segmentation and machine learning holds great promise for revolutionizing the detection and management of black rot disease in grape plants. As technology continues to advance, this integrated approach may serve as a model for addressing similar challenges in agricultural disease detection, ultimately contributing to improved crop yield and sustainable farming practices.

IX. ACKNOWLEDGEMENT:

We would like to express sincere gratitude to Dr. Thayyaba Khatoon, Head of the Department, Computer Science and Engineering (AI & ML), Malla Reddy University for her timely suggestions which helped us to complete the project in time. We would like to thank our project guide,DR.Arivazhagan, Professor, Computer Science and Engineering (AI & ML), for his timely cooperation and valuable suggestions throughout the project. We are indebted to his for the opportunity given to work under his guidance . Our sincere thanks to all the teaching and non-teaching staff of Department of Computer Science and Engineering (AI &ML) for their support throughout our project.

X. REFERENCE:

[1] Kirti,Navin Rajpal,Black Rot Disease Detection in grape plant(Vitis Vinifera)Using Colour based Segmentation and Machine Learning 2020 2nd International Conference on Advances in Computing, Communication Control and Networking (ICACCCN).