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Disease Detection Of Various Fruits Using Image Preprocessing

Done By

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Abstract:

Diseases in fruit cause devastating problem in economic losses and production in agricultural industry worldwide. In this project, a solution for the detection and classification of fruit diseases is proposed and experimentally validated. Our experimental results express that the proposed solution can significantly support accurate detection and automatic classification of fruit diseases. An early detection of fruit diseases can aid in decreasing such losses and can stop further spread of diseases. A lot of work has been done to automate the visual inspection of the fruits by machine vision with respect to size and colour.

Keywords:

K-Means-Clustering;SupportVectorMachine;Texture Classification

1.INTRODUCTION:

The traditional method for identifying and diagnosing fruit illnesses relies solely on expert observation with the unaided eye. Due to their availability's remote locations, consulting specialists can be costly and time- consuming in some underdeveloped nations. Automatic identification of fruit illnesses is critical in order to detect disease symptoms as soon as they develop on growing fruits. Fruit infections can result in significant productivity and quality losses during harvesting.

Image classification using CNN is most effective. First and foremost, we need a set of images. In this case, we take images of beauty and pharmacy products, as our initial training data set. The most common image data input parameters are the number of images, image dimensions, number of channels, and number of levels per pixel. There are some illnesses that spread to the tree's branches, leaves, and other parts, including the twigs. Apple scab, apple rot, and apple blotch are three common illnesses that affect apples. Apple scabs are grey or brown corky patches on the skin. Infections of apple rot cause slightly depressed, round brown or black This research considers five types of fruits i.e. Apple, mango, orange, pomegranate and tomato with two common appeared diseases i.e. fruit rot & anthracnose. The Symptoms of anthracnose seem at first as little, roundabout, marginally depressed sores on the outside of aging organic products. The spots fast spread,, become severely discouraged, and develop a water-splashed appearance directly beneath the skin of the foods developed from the ground rings framed in the focal point, become severely discouraged, and develop a water-splashed appearance directly beneath the skin of the foods developed from the ground rings framed in the focal point of the injuries. The organic product spoils malady advances with slow increment of sore, causing a vile decay, and of the injuries. The organic

product spoils malady advances with slow increment of sore, causing a vile decay, and microscopic organisms may overflow the epidermis and split the influenced region. Side effects can go from shallow flecking to depressed sores, dark coloured dark, dry.

2.OBJECTIVE:

This project aims to develop a robust and automated system for the early detection of various diseases in fruits using image processing and machine learning techniques. This system will leverage the power of image analysis to identify signs of disease on fruits at an early stage, enabling timely intervention and minimizing crop losses. This system will employ image processing techniques to analyze digital images of fruits. The core objective lies in effectively preprocessing the images to enhance disease-specific features and prepare them for subsequent disease classification. This project proposes a system for detecting diseases in various fruits using image preprocessing techniques. By effectively preparing the images for subsequent disease classification, the system has the potential to significantly enhance disease management in the agricultural sector, leading to improved crop yields and reduced economic losses. Further research can explore more sophisticated machine learning algorithms and address real-world implementation challenges to create a robust and practical solution for farmers.

3.LITERATURE SURVEY:

3.1: Problem Definition:

The problem definition of disease detection in various fruits using image preprocessing involves utilizing computer vision techniques to identify and classify diseases or abnormalities in fruit images. Here's a breakdown of the problem:

1.**Data Collection**: Gather a diverse dataset of fruit images containing both healthy and diseased samples. Images should cover different types of fruits and various stages of diseases.

2.Image Preprocessing: This step involves preparing the images for analysis. Techniques may include:

- **Resizing:** Ensuring all images have the same dimensions for consistency.

•**Noise Reduction**: Removing noise and artifacts that could interfere with analysis.

•**Normalization:** Adjusting brightness, contrast, and colour balance for consistency.

3.Model Selection: Choose an appropriate machine learning or deep learning model for classification. Popular choices include:

•**Convolutional Neural Networks (CNNs):** Especially effective for image classification tasks.

•**Support Vector Machines (SVMs):** Suitable for smaller datasets with fewer features.

•**Random Forests or Decision Trees**: Effective for classification tasks with interpretable outputs.

4.Model Training: Train the selected model using the preprocessed images. This involves feeding the images into the model along with their corresponding labels (healthy or diseased).

5.Model Evaluation: Assess the performance of the trained model using metrics such as accuracy, precision, recall, and F1-score. This step helps determine how well the model generalizes to unseen data.

6.Deployment: Deploy the trained model into a practical application where it can analyze new fruit images and classify them as healthy or diseased in real-time.

By following these steps, the goal is to develop an accurate and reliable system for detecting diseases in various fruits using image preprocessing techniques and machine learning algorithms.

3.2: SOFTWARE ENVIRONMENT: INTRODUCTION TO PYTHON

Python is a versatile, object-oriented, high-level programming language known for its dynamic semantics. Its rich set of built-in data structures, coupled with dynamic typing and binding, make it exceptionally suitable for swift application development. Additionally, it serves as an ideal scripting or integration language to link various preexisting components. Python's clear and easy-to-learn syntax prioritizes readability, thus minimizing the expenses associated with program maintenance. The language also supports modules and packages, fostering program modularity and code reusability. Furthermore, the Python interpreter, along with its extensive standard library, is available in both source and binary formats, free of charge, for all major platforms, and can be freely distributed.

Python, is developed by Guido van Rossum in 1991, stands as a programming language renowned for its effectiveness in statistical analysis, data manipulation, and machine learning. With Python, users can effortlessly craft objects, functions, and packages, offering a wide range of flexibility. This language knows no bounds and finds utility across diverse domains. It thrives on platform independence, seamlessly working on various operating systems. What's more, Python is an open-source tool, ensuring cost-effective accessibility, enabling its installation in any organization without the need for costly licenses.

Features of python

- Easy to understand
- Very Flexible
- Scalability
- Readability
- Robust Library, etc.,

3.2.2 Installation of python:

- Download python from https://www.python.org/downloads/release/python-372/

- Click on Download python for Windows" > "base" > "Download python3.7.2 for Windows")
- Install python. Leave all default settings in the installation options. • Set the path.

3.2.3 Installing Packages

- Packages can be installed with the **pip install package_name** function in python.
- To import any package in the program we should use **import package**_name

3.2.4 Libraries of python:

1. tkinter

Python offers multiple options for developing GUI (Graphical User Interface). Out of all the GUI methods, tkinter is the most commonly used method. It is a standard python interface to the Tk GUI toolkit shipped in python. Python with tkinter is the fastest and easiest way to create GUI applications

How can we use tkinter:

Simply by importing the tkinter module, you can access its functionalities.

How to create a tkinter app?

Importing the module - tkinter

Create the main window (container)

Add any number of widgets to the main window
Apply the event trigger on widgets

2.Numpy

NumPy can be used to perform a wide variety of mathematical operations on arrays. It adds powerful data structures to Python that guarantee efficient calculations with arrays and matrices and it supplies an enormous library of high-level mathematical functions that operate on these arrays and matrices.

3.Pandas

Pandas is an open-source, BSDlicensed Python library providing high performance, easy-to-use data structures and data analysis tools for the Python programming language. Python with Pandas is used in a wide range of fields including academic and commercial domains including finance, economics,

Statistics, analytics, etc.

Features of Pandas:

•**Efficient DataFrame:** A fast and efficient DataFrame object with support for both default and customized indexing.

•**Data Loading Tools:** Tools to seamlessly load data from various file formats into in-memory data structures.

•**Missing Data Handling:** Built-in capabilities for data alignment and efficient handling of missing data.

•**Data Reshaping:**

Functions for reshaping and pivoting datasets.

- **Label-Based Selection:**

Intuitive label-based slicing, indexing, and subsetting for large datasets.

- **Column Manipulation:**

Ability to easily delete or insert columns in data structures.

- **Grouping and Aggregation:**

Built-in functions for grouping data, enabling aggregation and transformations.

- **High-Performance Merging:**

High-performance merging and joining of data from different sources.

- **Time Series Support:**

• Comprehensive Time Series functionality for working with time-based data.

•2.4 Hardware and Software Requirements:

- Hardware Requirements
- Hard disk : 120GB
- Monitor : 14 inches
- Input Devices : keyboard , mouse
- RAM : 8GB
- **Software Requirements**

• Operating System : Windows 11 Coding

• Language : Python

4.SYSTEM DESIGN:

Designing a system for disease detection of various fruits using image preprocessing involves several components, including data collection, preprocessing, model training, inference, and deployment. Here's a high-level overview of the system design:

1.Data Collection and Preparation:
• Gather a diverse dataset of fruit images, including both healthy and diseased samples for each type of fruit.
•Annotate the images with labels indicating the presence or absence of diseases.

•Split the dataset into training, validation, and testing sets.

2.Image Preprocessing:

•Resize all images to a uniform size to ensure consistency.

•Apply techniques such as noise reduction, normalization, and segmentation to enhance image quality and extract relevant features.

•Extract features such as colour histograms, texture descriptors, and shape characteristics to represent each image.

3. Model Selection:

• Choose an appropriate machine learning or deep learning model for classification.

• Convolutional Neural Networks (CNNs) are commonly used for image classification tasks due to their ability to learn hierarchical features

4. Model Training:

• Initialize the chosen model with random weights or pre-trained weights.

• Train the model using the preprocessed images and their corresponding labels.

• Utilize techniques such as data augmentation to increase the diversity of training samples and prevent overfitting.

5. Model Evaluation:

• Evaluate the trained model on the validation set to assess its performance.

• Use metrics such as accuracy, precision, recall, F1-score, and confusion matrix to measure classification performance.

6. Deployment:

• Once the model achieves satisfactory performance on the validation set, deploy it to a production environment.

• Implement the model in a web application, mobile app, or edge device, depending on the deployment requirements.3

• Ensure scalability, reliability, and security of the deployed system.

7. Monitoring and Maintenance:

• Monitor the deployed system to track its performance and detect any issues or anomalies.

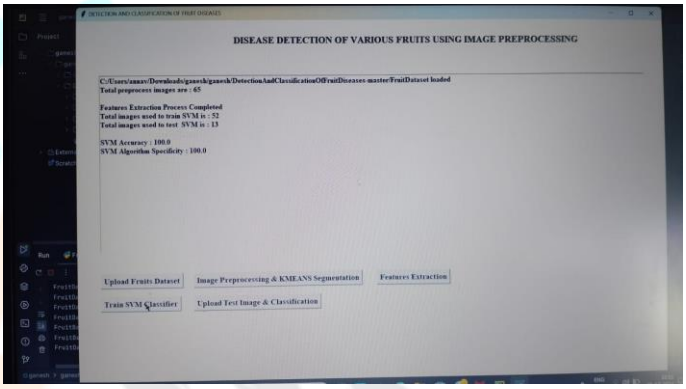
• Regularly update the model with new data to improve its accuracy and adapt to changing conditions.

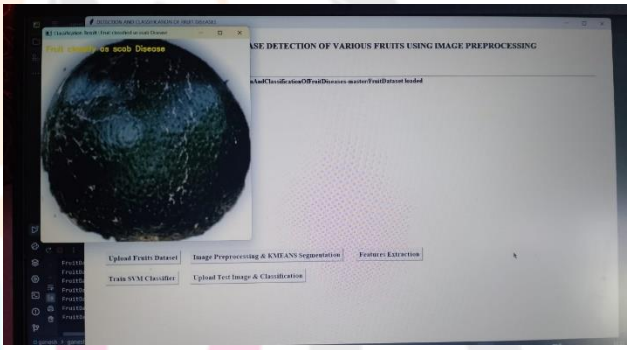
By following this system design, you can develop an effective and reliable solution for disease detection of various fruits using image preprocessing techniques and machine learning models**.**

5.RESULTS:

The results of disease detection of various fruits using image preprocessing depend on several factors, including the quality of the dataset, effectiveness of image preprocessing techniques, choice of machine learning or deep learning models, and evaluation metrics used. Here are some general observations and potential outcomes

OUTPUT:





6.CONCLUSION:

In conclusion, disease detection of various fruits using image preprocessing presents a promising solution to address agricultural challenges, ensuring crop health and maximizing yield. By leveraging advancements in computer vision and machine learning, this approach offers several key benefits:

1.Early Detection: Image preprocessing techniques enable the extraction of crucial features from fruit images, allowing for the early detection of diseases or abnormalities before they spread extensively.

2.Accurate Classification: Machine learning models trained on preprocessed fruit images can accurately classify healthy

and diseased fruits, aiding farmers in identifying and addressing potential issues in their crops.

3.Increased Efficiency: Automation of disease detection through image processing streamlines the monitoring process, saving time and resources for farmers who can focus on targeted interventions rather than manual inspection of each fruit.

4.Improved Crop Management: By providing timely insights into crop health, this approach empowers farmers to make informed decisions regarding irrigation, fertilization, and pest control, leading to optimized crop management practices.

5.Cost-Effective Solution: Compared to traditional methods of disease detection, which may involve labor-intensive field surveys or laboratory analysis, image preprocessing offers a cost-effective alternative that can be deployed at scale.

7.REFERENCES:

1.Barbedo, J. G. (2019). Plant disease detection with convolutional neural networks: Diagnostic scale analysis using polygon segmentation. Biosystems Engineering, 180, 96-107.

2.Mohanty, S. P., & Behera, S. (2017). Deep learning for image-based rice disease detection. Computers and Electronics in Agriculture, 139, 282-290.

3.Jiang, P., & Li, X. (2018). Automatic detection of apple leaf diseases using deep convolutional neural networks. Computers and Electronics in Agriculture, 152, 224-235.

4.Tazebay, S., & Bas, S. (2019). Automatic detection of apple fruit diseases using convolutional neural networks. Computers and Electronics in Agriculture, 158, 305-311.

5.Ramcharan, A., Barbedo, J. G. A., & Kuhn, D. N. (2019). Deep learning for image-based cassava disease detection. Frontiers in Plant Science, 10, 1-11.

6.Hughes, D. P., & Salathé, M. (2015). An open-access satellite imagery dataset for the detection of crops. Scientific Data, 2, 150072.

7.Haghighattalab, A., & Singh, A. (2018). Deep learning for plant identification in field conditions. Computers and Electronics in Agriculture, 151, 311-321.

8.Sharma, A., & Bhatt, P. (2021). A comprehensive review on deep learning based image classification and disease detection in agriculture. Computers and Electronics in Agriculture, 181, 105972.

9.Liu, Z., & Jia, K. (2018). A deep learning-based method for fruit disease recognition using optimized data augmentation. Sensors, 18(7), 2183.

10.Singh, A., & Ganapathysubramanian, B. (2017). Deep learning for plant stress phenotyping: Trends and future perspectives. Trends in Plant Science, 22(6), 531-542.