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COCONUT PALM DISEASE AND COCONUT MATURITY PREDICTION USING IMAGE PROCESSING AND DEEP LEARNING

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Abstract:

The project's primary objective is to find coconut palm disease and coconut maturity, with the objective of improving the quality of the product yield. It is difficult for a farmer to manually monitor coconut palm disease and maturity, which can take an extended period of time. Coconut palm diseases include seeding disease, white fungal disease, and spotting disease. The proposed system aids in the identification of coconut palm disease and coconut maturity, as well as to provide remedies for the disease and determining coconut maturity, which is the project's primary objective. Currently, solutions are found through image-processing techniques involving the identification of coconut maturity stages. As a matter of fact, an improved convolutional neural network model for order to detect two important coconut maturity stages, mature and immature, is proposed. Because of the complexity of the environment and the similarity between coconuts and their backgrounds, ability to detect the maturation stages of coconuts for harvesting without human intervention presents a challenge. To solve the problem, CNN model with Densenet architecture was employed for Coconut palm disease prediction and Resnet architecture was put to use for coconut maturity analysis. The final output will be easily obtained by using these architectures.

Keywords: CNN, DenseNet architecture, ResNet architecture, coconut palm disease, palm maturity.

I. Introduction:

India is the world's third-largest producer of coconut. The southern states of India produce the majority of the country's output [1]. Any disease that reduces the yield of a coconut plantation has a knock-on effect on the related industries and the livelihoods of the families who rely on the coconut economy. The goal of this paper is to use image processing algorithms and deep learning models to automate the detection of infected coconut palms and coconut maturity. Leaf blight disease, white fungal disease, and spotting are the most common diseases that affect coconut palms. To detect disease in coconut palms, an image processing algorithm and a CNN model (DenseNet architecture) are used.. The features of the coconut palm and coconut images are extracted using the image processing algorithm (E-M segmentation). The CNN model (ResNet architecture) is used to determine coconut maturity. To detect diseases in coconut leaves, image processing and a CNN algorithm are used. The goal of this paper is to use image processing algorithms and deep learning models to automate the detection of infected coconut palms. As a result, the goals of this research are to investigate efficient segmentation techniques for identifying the infected region in an image, to develop an optimised deep learning model to identify the infection from the segmented images, to compare the efficacy of pre-trained deep learning models using inductive transfer learning technique for predicting coconut maturity and coconut palm disease, and finally to interface the optimised deep learning model to instantly detect coconut

II. Literature Review:

Paper [2] As a result, the goals of this research are to investigate efficient segmentation techniques for identifying the infected region in an image, to develop an optimum deep learning model to identify the infection from the segmented images, to compare the efficacy of pre-trained deep learning models using inductive transfer learning technique for predicting coconut maturity and coconut palm disease, and finally to interface the optimised deep learning model to instantly detect coconut

Paper [3] focuses on the creation of an end-to-end framework for detecting stem bleeding disease, leaf blight disease, and Red palm weevil pest infection in coconut trees using image processing and deep learning technology. Segmentation algorithms were used to locate the abnormal boundaries in a set of images of healthy and unhealthy coconut tree images.

Paper [4] provides the use of mobile phones to capture images of the affected parts of a tree, which are then verified by experts and the results are sent to the farmer along with the remedies for the specific disease.

In this [5], We propose an agriculture technique that uses an NVIDIA Tegra System on Chip (SoC) and a camera-equipped drone to detect various pests in coconut trees. The drone flies across the coconut farm, capturing images and processing the data with a deep learning algorithm to identify unhealthy and pest-infested trees.

In this paper [6], We propose a precision agriculture technique that uses an NVIDIA Tegra System on Chip (SoC) and a camera-equipped drone to detect various pests in coconut trees. The drone flies across the coconut farm, capturing images and processing the data with a deep learning algorithm to identify unhealthy and pest-infested trees. A sample pest database is used by the deep learning algorithm. The Artificial Intelligence (AI) machine learning algorithm can also learn unsupervised from unstructured images. Wi-Fi is used to transfer the data directly to the farmer's smart phone. This aids in the timely treatment of pest-infected trees and increases tree yield.

This paper [7] employs various image processing techniques to detect palm disease. Digital image processing is a fast, dependable, and accurate method for disease detection; additionally, different algorithms can be used to identify and categorise plant leaf diseases. Many authors use clustering, color-based image analysis, classifiers, and artificial neural networks to detect illnesses, which are discussed in this article. Our research focuses on the investigation of various methods for detecting leaf disease, as well as an overview of various image processing techniques. This article also discusses how fruit disease is a devastating problem that causes economic and agricultural losses.. Detecting diseased fruit was previously done manually, but thanks to technological advances, image processing methods have been developed. There are two distinct phases: training and testing. All data relating to infected and non-infected fruit is saved during the training phase, and during the testing phase, it is determined whether the fruit is diseased or not, and if so, by which disease.

III. METHODOLOGY

The steps in the proposed methodology are as follows.

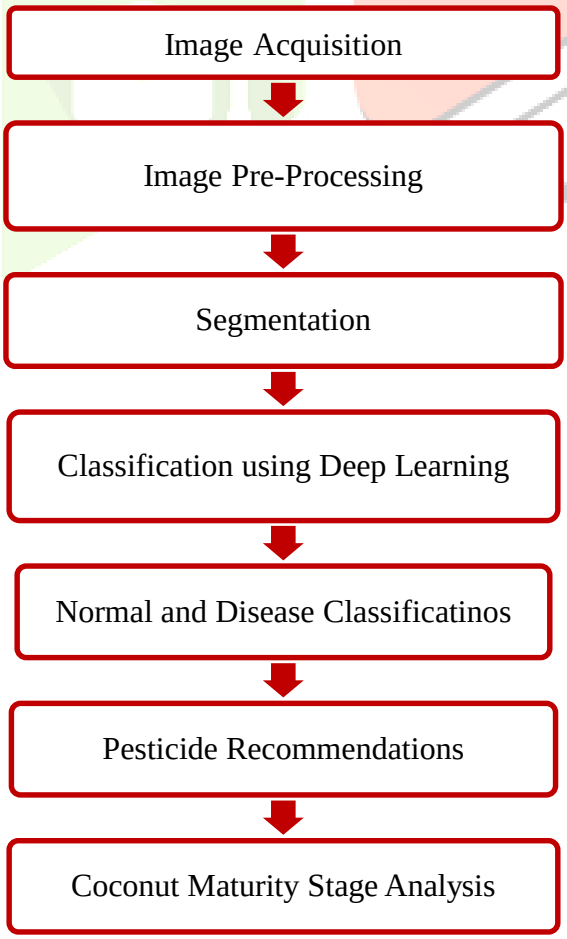

Fig.1. Proposed Methodology

Image Acquisition:

Image Acquisition is the process of obtaining an input image for the automatic detection of normal and diseased coconut palm images, as well as the maturation of coconut using Digital Image Processing.

Pre-processing:

At the most basic level of abstraction, both input and output are intensity images, which are referred to as pre-processing. The median filter is a type of nonlinear digital filter that is commonly used to remove noise from an image or signal. This type of noise reduction is a common pre-processing step used to improve the results of subsequent processing. In digital image processing, median filtering is widely used because it preserves edges while removing noise.

Segmentation:

The process of dividing a digital image into multiple images is known as image segmentation. The goal of segmentation is to transform an image's representation into something meaningful and easier to analyse. Image segmentation is commonly used to find objects and borders in images. An expectation-maximization (EM) algorithm is an iterative method for determining the maximum or minimum a posteriori (MAP) estimates of parameters in statistical models that rely on unobserved variables.

Classification using CNN Models (DenseNet and ResNet):

Input Layer:

Each CNN employs a 'input layer,' which takes images and resizes them before passing them on to subsequent layers for feature extraction.

Convolution Layer:

The following layers are 'Convolution layers,' which act as image filters, extracting features from images and calculating match feature points during testing. Since the invention of CNN, networks have been continuously improved through the addition of new layers and the incorporation of various image processing techniques.

Pooling Layer:

The extracted feature sets are then sent to the 'pooling layer'. This layer reduces the size of large images while retaining the most important information. It preserves the best fits of each feature within the window, preserving the maximum value from each window.

Rectified Linear Unit Layer (ReLU):

The following 'Rectified Linear Unit' or ReLU layer replaces all negative numbers in the pooling layer with 0. This assists the CNN in remaining mathematically stable by preventing learned values from becoming stuck near zero or blowing up towards infinity.

Fully Connected Layer:

The final layer consists of fully connected layers that translate the high-level filtered images into categories with labels.

IV. RESULT AND DISCUSSION:

Both palm disease prediction and coconut maturity are improved by the proposed system. The result on unhealthy palm gives the cause of the disease and a pesticide recommendation, and the newly proposed system gives more accuracy to the problem. The existing system used an SVM model, but it did not provide the required accuracy. The proposed system employed the CNN model because it provides more accurate and clear results. The existing system takes more time, whereas the proposed system takes less time. The existing system does not recommend pesticides to the infected palm, whereas the proposed system does. The existing system does not involve coconut maturity; the proposed system focuses on coconut maturity for the first time.

V. CONCLUSION & FUTURE SCOPE

In comparison to the existing system, the proposed system is more accurate. When compared to the existing system, the proposed system produces results in less time. The CNN model produces clear results, allowing the problem to be identified in real time. The result is a view of the infected part of the palm with clear pixel values. The matured and immature coconuts can be easily identified using the CNN model. The existing system's problem has been solved by employing the best methods in the project. In this project, a new pesticide recommendation system and coconut maturity are introduced in comparison to the existing system.

The future of farming is dependent on quick solutions. Future scope involves making the drone capable of carrying pesticides to the top of the palm and spraying them directly to the affected areas. As a result of the proposed system, an IoT device is used to pluck the ripe or matured coconut. An IoT device is designed using the proposed system result, and automatically plucking the ripe coconuts can also be used as a future scope.

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