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Field Monitoring System for Farmers

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Abstract: *We propose a computer vision device that utilizes a multi-spectral imaging sensor to detect external defects on orange citrus fruits. To begin, the proposed algorithm segments the orange fruit solely using the NIR portion of the captured Near-Infrared (NIR) and RGB images. Second, segmented RGB and NIR orange fruit images are pre-processed using certain adaptive pre-processing techniques. As a result, a thresholding technique is used to detect defects in the orange fruit's seven distinct color components. Finally, voters vote on whether or not the citrus fruit image is flawed based on the seven threshold color variable images. Utilities and parcel distribution companies have increased their performance over the last year. Online shopping provides many benefits to the postal and distribution industries. The seller's items are packaged in box-shaped cardboard boxes or wooden boxes in a variety of sizes. A contour-based shape representation algorithm is used to detect contoured objects. Contour is made up of fragments of edge or curve that represent geometric concepts. The object's size must be determined in order to determine its surface area. Dimensions are sometimes used to refer to an item's length, width, and height. The volume of the parcel box will be calculated using a multiplication programmed based on its length, width, and height. As a result, in a computer vision-based automated sorting system, contour-based object detection could be used to determine the volume of an object. The most critical characteristics for correct citrus classification and sorting are color and size.*

Keywords-*Convolutional Neural Network, Preprocessing, Feature Extraction.*

I. INTRODUCTION

Services and distribution companies have improved in the last year. Online shopping has many advantages for the postal and distribution industry. The seller's products are packed in various sizes of box-shaped cardboard boxes or

wooden boxes. A contour-based shape representation algorithm is contour-based object detection. Contour is composed of edge or curve fragments that depict geometric principles. The size of the object must be measured in order to determine the surface area. Dimensions are commonly used to describe the length, width, and height of an item. A multiplication program will be used to calculate the volume of the parcel box based on its length, width, and height. As a consequence, contour-based object detection can be used to measure the volume of an object in a computer vision-based automated sorting system. Color and scale are the most important characteristics for accurate citrus classification and sorting. Many farmer organizations are prioritizing automated grading of agricultural products due to the growing demand for high-quality food products in a short period of time. The driving factors behind these trends are increased consumer awareness of their better health well-being and a response by manufacturers to the need to provide quality assured products with consistency.

The most significant characteristics for proper citrus classification and sorting are color and scale. A number of farmer organizations are focusing their efforts on automated agricultural product grading in response to the increasing demand for high-quality food products. Increased customer understanding of their overall health and well-being, as well as manufacturers' responses to the ongoing need to produce high-quality goods, is driving these trends. In this context, automation and computer vision are critical components of agricultural product quality control. Estimating the size of orange fruits can also help with packaging, delivery, and marketing. The length, mass, and estimated area of agricultural materials are the most important physical characteristics in sizing systems.

II. MOTIVATION

To build an autonomous robot that can navigate within a space, recognize objects on a belt using color sensing, and sort them by relocating them to a specific location. Autonomous robots can help with menial or risky tasks in a variety of circumstances.

III. LITERATURE SURVEY

Ahmed M. Abdelsalam, Mohammed S. Sayed, "Real-Time Defects Detection System for Orange

Citrus Fruits Using Multi-Spectral Imaging" [1,] In this paper, to detect the external defects of orange citrus fruits, we propose a computer vision system that employs a multi-spectral imaging sensor. To begin, the proposed algorithm only uses the NIR portion of the captured Near-Infrared (NIR) and RGB images to segment the orange fruit. Second, some adaptive pre-processing techniques are used on the segmented RGB and NIR orange fruit images. As a result, a thresholding technique is used to identify defects in the seven distinct color components of the orange fruit. Finally, the seven threshold color variable images are voted on to determine whether or not the citrus fruit image is defective.

The overall accuracy of the algorithm is greater than 95%, and the proposed algorithm can process three images with a resolution of 640480 pixels per second.

Yuwei Chen, Jinghua Wu, Mengtian Cui "Automatic Classification and Detection of Oranges Based on Computer Vision [2], In this study, A computer vision-based automated orange grading detection system was proposed. The orange images were first gathered and preprocessed. Second, edge detection and image segmentation are used to separate the orange from the background. Four main features of orange were extracted based on image segmentation: fruit surface color, fruit size, fruit surface defect, and fruit form. The BP neural network was used to investigate these characteristics. Finally, a neural network was used to detect the automated orange grading. The grading accuracy of this grading system was 94.38 percent, and the classification accuracy of the first grade was 100 percent, according to the experimental results. It has a high correct identification rate and decent real-time efficiency as compared to the artificial system.

Vikas J. Nandeshwarl, Gargi S. Phadke2 and Siuli Das," Classification of Orange Juice Adulteration using LDA, PCA and ANN [3], Linear Discriminant Analysis (LDA), Principal Component Analysis (PCA), and Artificial Neural Network (ANN) detection techniques are used in this article to classify orange juice samples. The capability of a fractional order capacitor type sensor to detect various forms of adulterants in orange juice is also discussed. The PCA, LDA, and ANN detection techniques are compared in order to distinguish between various orange juice samples that contain pure juice, pure juice adulterated with sugar, and tap water. Coca-Cola provided the orange juice sample for this experiment. The sample data set consists of phase measurements taken at various frequencies and times within the Constant phase field. For data analysis, phase data is organized in a matrix format. The Discrimination index (DI) is used to compare the data cleansing methods PCA, LDA, and ANN, and the DI value is used to decide the best data cleansing method for orange juice samples.

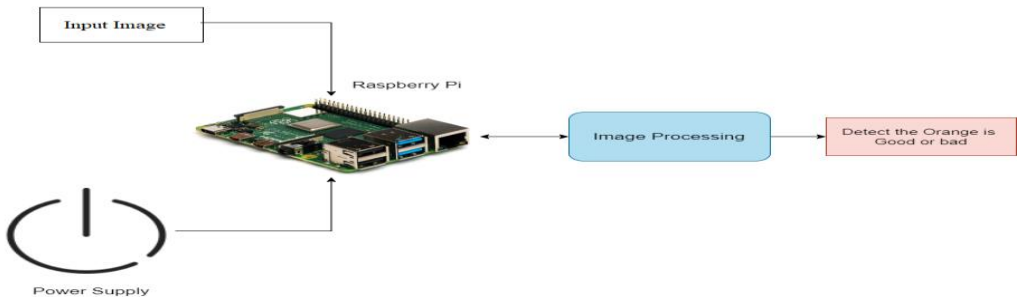
Ruhika Sharma Sukhpreet Kaur," Convolution Neural Network based Several Orange Leave Disease Detection and Identification Methods [4], Between 65 and 70 percent of the world's population depend on agriculture for their ecological, social, and biological well-being. As a result of leaf, fruit leaf, and plant disease damage, crop yields are reduced. Maximum fruit injury is caused by infection of the fruit's leaves, which reduces agricultural productivity and dominance. Citrus canker infection may affect plants or fruits like orange leaves, preventing them from bearing fruit. A challenging part of growing a plant's production is early disease detection. The aim of this research was to find, classify, and diagnose leaf disease. To begin, describe orange and orange leaf disease symptoms. After that, a detailed search of various records was carried out. GLCM, multi-SVM, threshold value, neural network, and fuzzy system are also addressed as detection and recognition techniques. The process for diagnosing infected orange leaves is then described using a convolutional neural network (CNN). In the classification and identification of leave disorder, convolutional neural networks are a significant field of research (CNN). The characteristics of the fruit (orange) leaves are obtained to diagnose and explain the disease. The stages involved in assessing the existence of leaves disease are discussed in this article. The stages of overcoming leaf diseases, such as the operation of conjuring up hidden

layers, feature visualization, semantic library, and consideration mapping, are also addressed. Finally, the structure of orange leaf disease, as well as the different steps and procedures, are depicted.

R. Thendral, A. Suhasini, and N. Senthil," A Comparative Analysis of Edge and Color Based Segmentation for Orange Fruit Recognition Priors [5] , We provided two segmentation methods in this article. Segmentation of photographs of orange fruits taken in natural lighting was performed using edge-based and color-based detection methods. Twenty digitized photographs of orange fruits were randomly collected from the Internet with the aim of locating and identifying an orange in each image. When the two segmentation methods' outputs were compared, we discovered that color-based segmentation consistently outperforms edge-based segmentation. The computation is performed using the MATLAB image processing toolbox, and the comparison results are shown in the segmented image results.

IV. PROPOSED SYSTEM ARCHITECTURE

Figure No 1: Proposed system architecture.



Modules:

Pre-processing : - The goal is to In this module, the machine will process the input. The data-set will be trained by the prepossessing computer, which will remove the noisy parts of the input. after which you can resize the data-set

Segmentation: It entails segmenting a visual input to make image analysis easier. We can split the image up into segments in which we can do further processing if we want to remove or identify something from the rest of the image, such as detecting an object from a context. This is referred to as segmentation. Segments are made up of sets of pixels, or "super-pixels," that represent objects or parts of objects.

Feature Extraction: Points, edges, and artifacts are all examples of image structures that can be used as functions. Feature extraction is the method of reducing the number of features in a dataset by reusing previously used ones (and then discarding the original features). The original set of features should then be capable of summarizing the vast majority of the data contained in the new reduced set of features. Feature extraction starts with measured data and generates derived values (features) that are intended to be insightful and non-redundant, thus promoting learning and

generalization processes and, in some cases, resulting in more precise human interpretations. The extraction of features and the reduction of measurements are inextricably related.

Classification: CNNs are used for image detection and recognition due to their high precision. In a classification convolutional neural network, each set of neurons analyses a specific region or "feature" of the image in a three-dimensional structure. A CNN's neurons are divided into groups that each concentrate on a different aspect of the picture. The algorithm examines smaller sections of the images. The end result is a probabilistic vector predicting the likelihood of each feature in the image belonging to a class or category.

V. ALGORITHM

Convolutional Neural Network (CNN): Convolutional neural networks, or CNNs, are a form of deep learning neural network. In a nutshell, CNN is a machine learning algorithm that can analyses an input image and assign significance (learnable weights and biases) to different aspects/objects while also distinguishing between them. CNN collects data by removing attributes from images. The following elements make up each CNN:

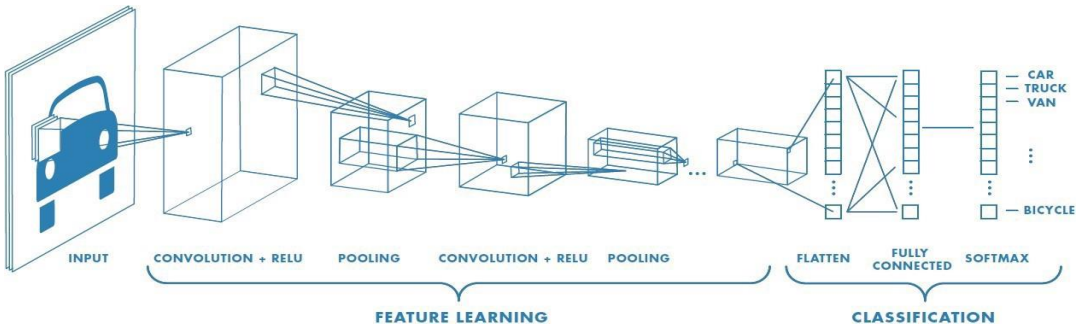
1. Use a gray scale image as the input layer.

2. The output layer, which can be either binary or multi-classed. Secret layers include convolutional layers, ReLU (rectified linear unit) layers,

3. pooling layers, and a

4. fully connected Neural Network. Artificial Neural Networks (ANNs), which are made up of multiple neurons, are incapable of extracting features from photos. The convolutional and pooling layer combinations come into play at this stage. Similarly, classification is impossible with the convolutional and pooling layers, necessitating the use of a fully connected Neural Network. Let's take a closer look at each of these segments before delving further into the definitions.

Figure No 2 - Illustrates the CNN process from input to Output Data.



VI. Result

Figure No 3 -Bad quality orange.

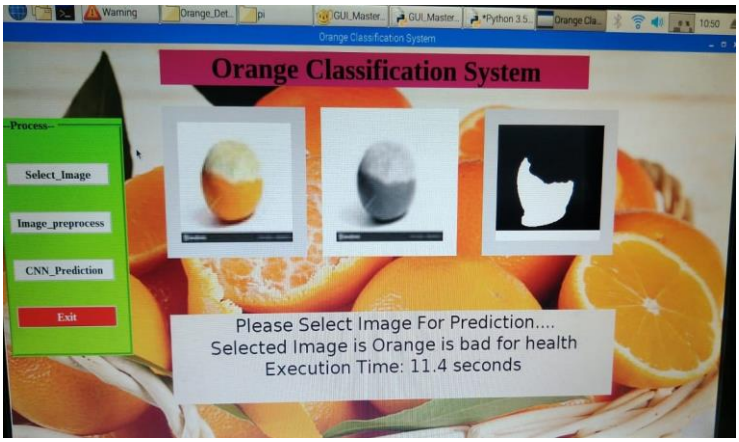
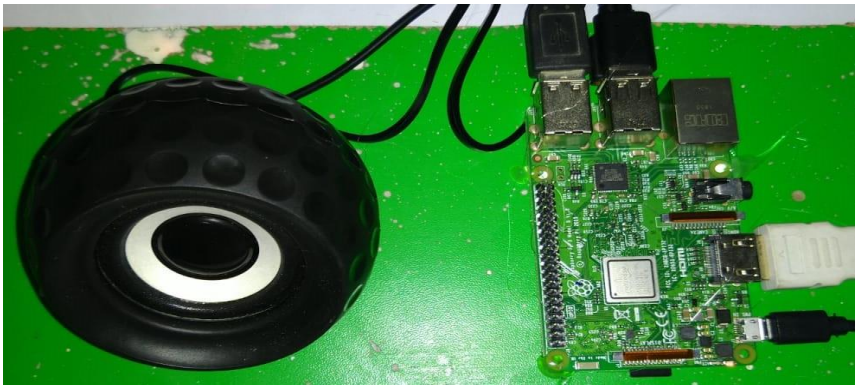


Figure No.4: Good quality orange

Figure No.5: Actual system for proposed Hardware.



VI. CONCLUSION:

With the aid of image processing techniques, an automatic Orange fruit detection and segregation system is being introduced. The system also includes the segregation of Orange fruits and the packaging of boxes with the appropriate number of Orange fruits. Since the device is programmable, it can be tweaked to improve speed and accuracy. Scalability allows for the inclusion of a greater number of functions. Since the device includes both a processing board and image processing, there is more versatility on both sides. The greatest benefit comes from systems that need very little human interaction. This system is important, state-of-the-art, and keeping pace with farming and packing because of its increased precision, high speed, and modularity.

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