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HYBRID FEATURE BASED RECOGNITION OF FRUITS AND VEGETABLES USING DEEP LEARNING MODEL

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ABSTRACT

The ability to identify the fruits based on the quality in food industry is very important nowadays where every person has become health conscious. There are different types of fruits available in the market. However, to identify best quality fruits is cumbersome task. Therefore, we come up with the system where fruit is detected under natural lighting conditions. The method used is texture detection method, color detection method and shape detection. For this methodology, we use image segmentation to detect particular fruit. Fruit Detection project is implemented in python image processing toolbox. The project is implemented for both Real time and Non-Real time. The proposed method has four stages: First is Pre-Processing and second is Feature Extraction and third is Segmentation and fourth Recognition. In case of Non Real time, the first stage is used to browse the image, second stage is extraction of the features from images using Grey Level Co-occurrence Matrix (GLCM), RGB and Color Histogram. System will convert the image from RGB to grayscale image for further processing. The color histogram represents the distribution of colors in an image. Since image is captured under different illumination condition. In the third stage, the three extracted image is obtained in the form of red, green and blue. In the fourth stage, the extracted features are used as input to Support Vector Machine (SVM) classifier. Then name ofthe fruit is output is obtained.

Keywords: SVM, CNN, RGB, Grey Level Co-occurrence Matrix (GLCM), Color Histogram.

I. INTRODUCTION

Recognizing different kinds of vegetables and fruits is a difficult task in supermarkets, since the cashier must point out the categories of a particular fruit to determine its price. The use of barcodes has mostly ended this problem for packaged products but given that most consumers want to pick their products, they cannot be pre-packaged, and thus must be weighed. A solution is issuing codes for every fruit, but the memorization is problematic leading to pricing errors. Another solution is to issue the cashier an inventory with pictures and codes, however, flipping over the booklet is time consuming. Automatic classification of fruits via computer vision is still a complicated task due to the various properties of many types of fruits. The fruit quality detection technique which was based on external properties of fruits such as shape, size and color. The proposed method is based on the use of Support Vector Machine (SVM) with the desirable goal of accurate and fast classification of fruits.

II. LITERATURE SURVEY

In [1], they have recognized nine different classes of fruits. Fruit image dataset are obtained from web as well as certain images are acquired by using mobile phone camera. These images are pre-processed to subtract the background and extract the blob representing fruit. For representing fruits and capturing their visual characteristics, combination of color, shape and texture features are used. These feature datasets is further passed to two different classifiers multiclass SVM and KNN. The color image is firstly converted to grayscale by GLCM (Gray Level Concurrence Matrix). The image is further converted to binary image. Further, Morphological operations are used to fill the holes and extract the largest blob or object from the image which would further be considered as fruit. After that this largest blob is cropped and the binary values are replaced with original intensity values. From the experiments it can be concluded that the combination of color texture and shape gives better or comparable results in most of the cases than when any two categories of features are used. Also, the second conclusion which can be made is that KNN gives better results for this case than SVM.

In [2], has different steps of the training process in this research which are as follows: Initially collect fruits image, then feature extraction process using FCH & MI method to get the characteristic of fruits image then transformed into vector feature form which will be stored in the database. Later clustering process is done

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using the K Means Clustering method on the vector of the fruits image in the database. The steps of the testing process in this research are as follows: Open file image query to detect fruits. Thenext step is to get the feature of the face image then transformed into the vector feature form same as training process. Then, the process of recognition using the KNN method by calculating the distance between the new fruits image features and features of the existing on the database by using Euclidian distance which then matched with the clustering results.

III. PROPOSED WORK

Fruits should be categorized according to their accuracy for all fruit vendors. There are numerous similarities among apples, cherries, and many other Different fruit varieties share a lot of similarities, so a key element is classification. Although, there Machine learning for fruit classification has issues. Additional SVM (Support Vector Machine) Network of convolutional neurons (CNN).the techniques for CNN, a network with fully linked nodes and pooling layers, been used to deal with the issues. Among them, CNN the features of have been extracted using pooling layers.

IV. METHODOLOGY

DATASET

In this project we get dataset from kaggle. This dataset contains images of the following food items**: fruits**- banana, apple, pear, grapes, orange, kiwi, watermelon, pomegranate, pineapple, mango. **vegetables**- cucumber, carrot, capsicum, onion, potato, lemon, tomato, raddish, beetroot, cabbage, lettuce, spinach, soy bean, cauliflower, bell pepper, chilli pepper, turnip, corn, sweetcorn, sweet potato, paprika, jalepeno, ginger, garlic, peas, eggplant.

This dataset contains three folders: train (100 images each), test (10 images each) validation (10 images each) each of the above folders contains subfolders for different fruits and vegetables wherein the images for respective food items are present.

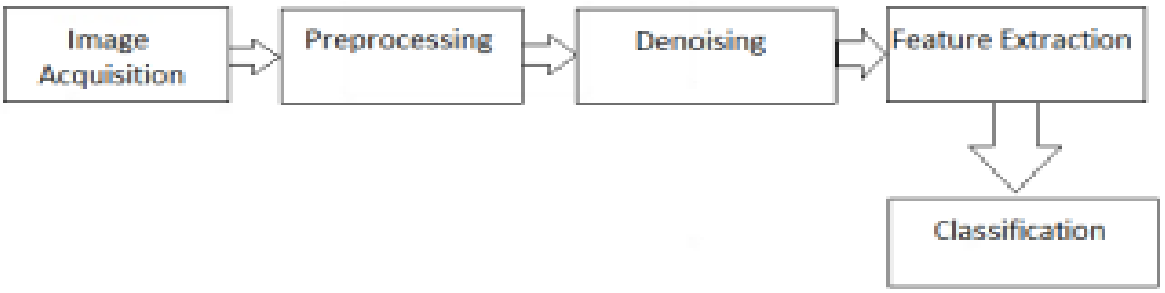

Fig 1: Basic classification of fruit

RGB

It is also referred to as true color image which defines Red, Green and Blue color components for each individual pixel. This RGB array is of class double where each color component is a value between 0 and 1. This can be stored along the third dimension of data array.

GLCM (Gray Level Co-occurrence Matrix)

It is statistical method that examines the texture that considering the pairs of pixels with specific values. It mainly consists of statistic feature like contrast which measure the local variation, correlation which measure the joint probability, energy whichprovides the sum of squared elements and homogeneity which measures the closeness of the distribution.

Color Histogram

It controls the appearance and behavior of image. It converts color image into HSV image and preserves the hue and saturation components. The values are extracted and plotted in the graph. The intensity matrix is obtained from the HSI image matrix. This matrix is updated with histogramequalized intensity matrix.

Color moments

Color moments are very much useful for color indexing purposes. It considers only the first three color moments as feature in image retrieval applications. It can be used to compare the two images based on color.

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HOG feature

The histogram of oriented gradients (HOG) is a feature used in vision and image processingfor object detection. The image is divided into small connected regions called cells. Since it works on local cells, it is invariant to geometric transformations.

HSV Feature

The Hue Saturation Value (HSV) represents the color, dominance of color and brightness. Therefore, the color detection algorithm can be used to search in terms of color position and color purity. It is used to detect the pixels.

SVM (Support Vector Machine)

It is a supervised learning algorithm which can used for binary classification or regression. It is a coordinate of individual observations. It is based on decision planes which defines decision boundaries. It also separated the set of objects having different class. The system is built on two different environments namely using Real Time Fruit and Non-Real Time Fruit.

Non-Real time: Non-real time, or NRT, is a term used to describe a process or event that does not occur immediately. A non-real time system is one in which we cannot guarantee the response time of a task. These systems are nondeterministic in nature and we cannot predict the behavior of the system with respect to time. For example, communication via posts in a forum can be considered non real time as responses often do not occur immediately and can sometimes take hours or even days. In Non-Real timeprocess begins with. training the data where features are extracted and stored in the dataset. Fruit image is then browsed. In the further process testing takes through preprocessing, image segmentation, Feature extraction and finally recognition

CNN also decreases the amount of hyper parameters used by the method. It takes less time as a result. training. The training and testing accuracy of CNN is significantly higher than that of the SVM method. Consequently, it is Simple, quick to pick up, and easy to understand.

V. RESULT ANALYSIS

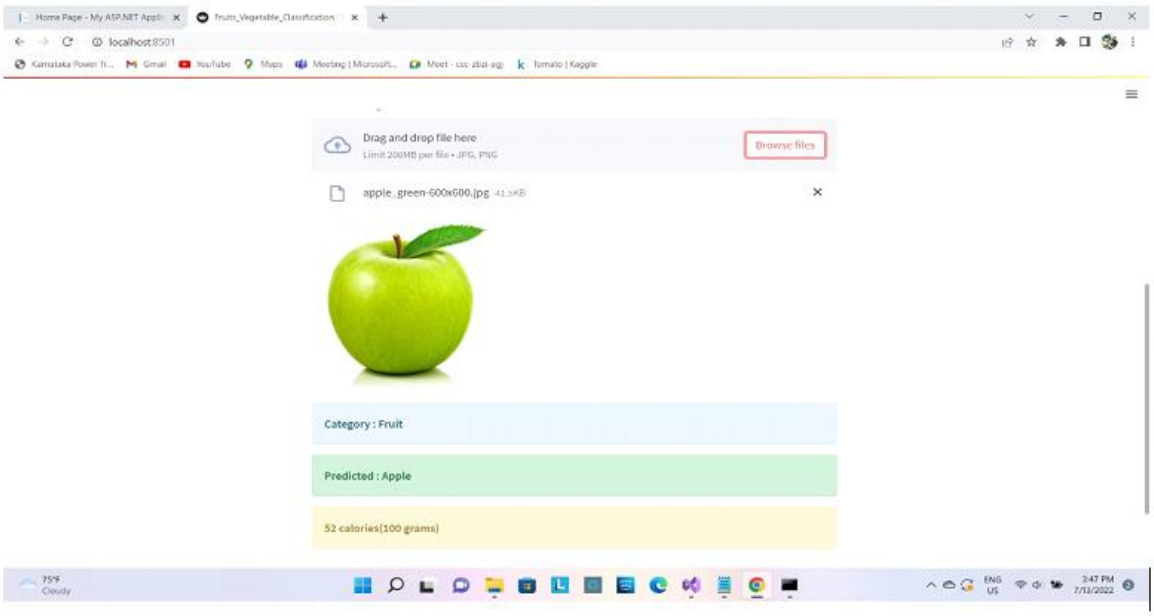

Fig 2: Shows the output of the Non Real time fruit image

In the Above Figure its Showing the final output of our project this process contains the below steps.

Pre-processing consist of image getting converted into grayscale and further gets converted into gray threshold, then to black and white image by removing the unwanted impurities. Next process is the image segmentation were, the three images are obtained in the cluster format. The images obtained are R, G and B image It is also referred to as true color image which defines Red, Green and Blue color components for each individual pixel. This RGB array is of class double where each color component is a value between 0 and 1. This can be stored

along the third dimension of data array It is statistical method that examines the texture that considering the pairs of pixels with specific values. It mainly consists of statistic feature like contrast which measure the local variation, correlation which measure the joint probability, energy which provides the sum of squared elements and homogeneity which measures the closeness of the distribution.

It controls the appearance and behavior of image. It converts color image into HSV image and preserves the hue and saturation components. The values are extracted and plotted in the graph. The intensity matrix is obtained from the HSI image matrix. This matrix is updated with histogram equalized intensity matrix. Color moments are very much useful for color indexing purposes. It considers only the first three color moments as feature in image retrieval applications. It can be used to compare the two images based on color. The histogram of oriented gradients (HOG) is a feature used in vision and image processing for object detection. The image is divided into small connected regions called cells. Since it works on local cells, it is invariant to geometric transformations.

The Hue Saturation Value (HSV) represents the color, dominance of color and brightness. Therefore, the color detection algorithm can be used to search in terms of color position and color purity. It is used to detect the pixels.

It is a supervised learning algorithm which can used for binary classification or regression. It is a coordinate of individual observations. It is based on decision planes which defines decision boundaries. It also separated the set of objects having different class. Recognition: In this step the SVM and CNN algorithm is used to recognize the fruit by comparing the values from test and train dataset. The value obtained is used to determine the fruit which is examined. After this process SVM algorithm is applied and name of the fruit is displayed.

VI. CONCLUSION

The proposed project is able to recognize the fruit based on the features like shape, color, and texture. This increases the knowledge of common people about some rare and unknown fruits. The project is mainly concentrating on reducing human effort and making human life easier. Fruit recognition will be able to reduce the current ongoing problems. It reduces confusion among the particular fruit. Future work that can be added to this project may be the development of a web app.Here the user can use this application anytime anywhere.

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