AUTOMATIC FRUIT SORTING USING K-NN ALGORITHM

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ABSTRACT:

The process of arranging items systematically is called sorting. This is the time of globalization and we here tend to solve the problem for mainly packaging industries as well as the supermarkets. Everyday tons of fruits, vegetables, and many different packets of foods are supplied to big supermarkets, malls, industries etc. Sorting is done based on different parameters like size, shape, quality, color etc. As this technique is done manually it is a time-consuming process, less efficient and also inconsistent method. By manually sorting techniques we can sort only single fruit with single or multiple parameters. To overcome this less efficient and inconsistent method, we are using automatic sorting techniques as it is automatic, reliable and efficient. Automatic Sorting Technique is used, by using Image Processing Technique and K-NN Classification in order to sort, control and monitor the process. Image processing is used to identify and sort items on the basis of color into different bins.

Keywords: Machine Learning, KNN Algorithm, SVM, Naive Bayes, Pre-processing, Feature Extraction

I. INTRODUCTION

The world is growing rapidly every day and hence everything should be automated to minimize cost and preserve time. Astronomically immense manpower is needed for sorting and counting of fruits and this takes an extravagant amount of time which minimizes the productivity and it is not productive additionally. Keeping this in mind we came up with the conception of fruit detection, counting, and freshness of the fruit by utilizing the K-NN classifier. We are going to implement a system with the K-NN Algorithm module utilizing python and machine learning. This system will run on a genuine-time substratum as well as it has the option to upload images or we can verbally express data sets for detection, counting, and freshness detection. Utilizing the KNN algorithm it will detect the freshness of the fruit.

I.PROPOSED IDEOLOGY:

K Nearest Neighbors (KNN) is a very unassuming and multipurpose algorithm used in various applications like health care, image recognition, classification, and regression, etc. It is based on feature similarity approach for regression and classification problems. This model structure determined the dataset. All training data used in the testing phase. It required some time for scanning all data points. In KNN, K is the number of nearest neighbors. The number of neighbors is the core deciding factor. K is generally an odd number if the number of classes is 2. When K=1, then the algorithm is known as the nearest neighbor algorithm.

A.DETAILS OF DATASET

Dataset consists of majorly three types of fruits; these three types of fruits are of many characteristics based on their feature. The dataset has Oranges, Apple and Mango. The characteristics contained in the dataset are different features like shape, Size, Freshness and color. The dataset contains all these characteristics in three fruits. The dataset totally consists of two categories: one is the training dataset and the other is a testing dataset. In the testing dataset each category of three different fruits is of the count 55 fruits. In the training dataset each category of three different fruits is of the count of 22 apples, 24 mango and 20
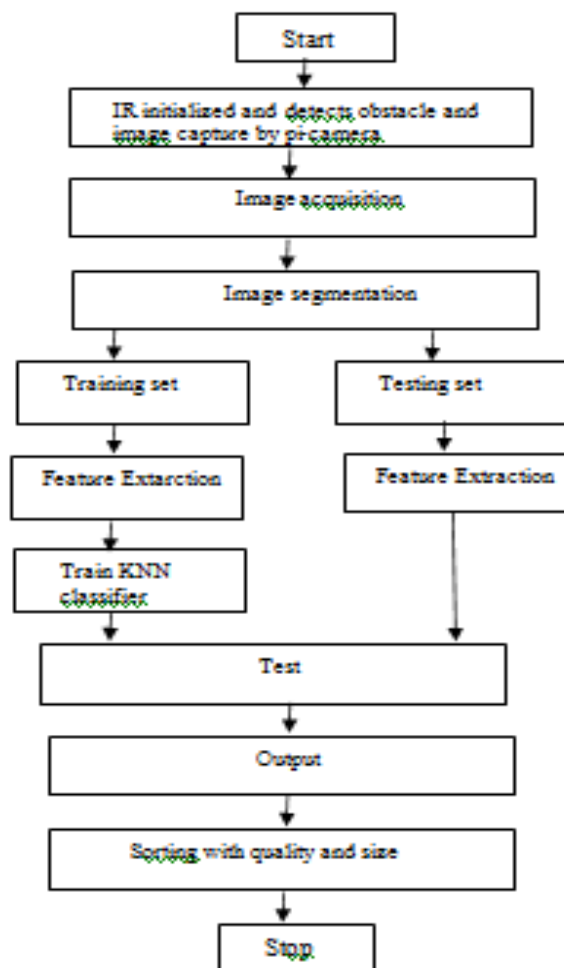

Figure 3.1: Flowchart

Sorting is a technique which is used to arrange the items in a systematic manner. The features are a way to identify the data. A better representation of these data can be done with the help of image processing. These can be achieved through the feature extraction and Image segmentation. By using these techniques, we can identify the feature of the fruits and shape of the fruit. The fruit after identifying the can be given to the k-NN classifier to check nearest value and then provides the output in a proper depending on the quality it can be further sorted.

Feature Extraction:

Feature extraction refers to the process of transforming raw data into numerical features that can be processed while preserving the information in the original data set. Feature extraction can be accomplished manually or automatically. Manual feature extraction requires identifying and describing the features that are relevant for a given problem and implementing a way to extract those features.

Building the k-NN Classifier involves the following steps:

- Load the data.
- Initialize K to your chosen number of neighbors.
- For each example in the data, calculate the distance between the query example and the current example from the data.
- Add the distance and the index of the example to an ordered collection.
- Sort the ordered collection of distances and indices from the smallest to largest by the distances.
- Pick the first K entries from the sorted collection.
- Get the labels from the selected K entries.
- If regression, return the mean of the K label.
- If classification, return the mode of the K labels.

IV.IMAGE SEGMENTATION TECHNIQUES:

A.   Threshold Based Segmentation: Image thresholding segmentation is a simple form of image segmentation. It is a way to create a binary or multi-color image based on setting a threshold value on the pixel intensity of the original image. In this thresholding process, we will consider the intensity histogram of all the pixels in the image. Then we will set a threshold to divide the image into sections.

Considering an image with a background and an object, we can divide an image into regions based on the intensity of the object and the background. But this threshold has to be perfectly set to segment an image into an object and a background.

B.   Edge Based Segmentation:

Edge-based segmentation relies on edges found in an image using various edge detection operators. These edges mark image locations of discontinuity in gray levels, color, texture, etc. When we move from one region to another, the gray level may change. So, if we can find that discontinuity, we can find that edge. A variety of edge detection operators are available but the resulting image is an intermediate segmentation result and should not be confused with the final segmented image. We have to perform further processing on the image to the segment it.
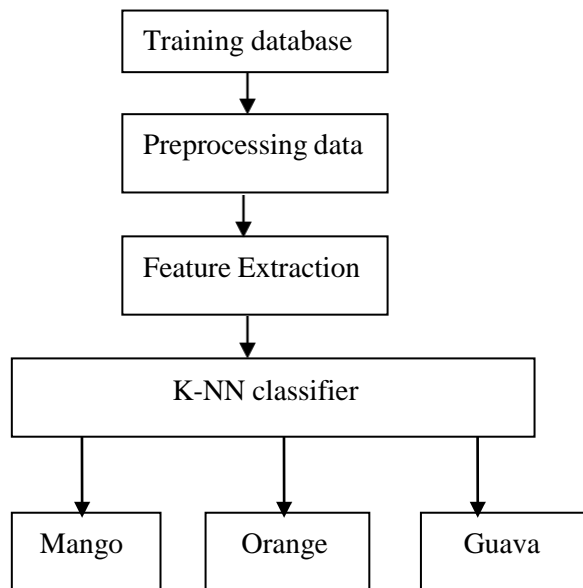
```
Training database
      ↓
Preprocessing data
      ↓
Feature Extraction
      ↓
K-NN classifier
   ↓      ↓      ↓
Mango  Orange  Guava
```

Fig4: Training Process workflow

```
Testing database
      ↓
Preprocessing data
      ↓
Feature Extracion
      ↓
K-NN classifier
   ↓      ↓      ↓
Mango  Orange  Guava
```
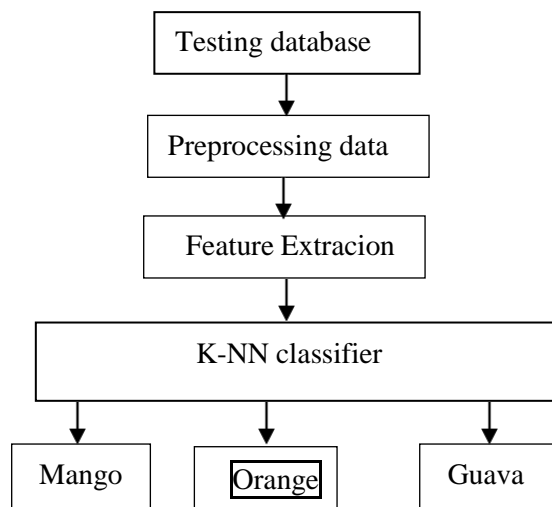
Fig5: Testing process workflow

The dataset that is taken is trained and then it is tested. Based on the training and testing dataset all the required features are extracted and the sorting is done depending on the color, size and the freshness of the fruit

V.RESULTS:

Accuracy:

Precision of KNN with no preprocessing: 89.39%

Try classifier – No Preprocessing

Precision of KNN with preprocessing – thresholding : 89.39%

Try classifier – Preprocessing thresholding

VII. CONCLUSION:

This project proposes the mechanism to sort the fruit according to size and quality at a time. KNN algorithm is the active classification algorithm for automatic fruit sorting. The recognition of fruit is accurate up to 90%. The system having advantages of high accuracy and low cost. The proposed system reduces the errors to its minimum value and sorts the fruit based on two parameters. Some features we can implement with this system for fruit recognition and classification like counting the number of fruits, measuring the weight, and give the information.

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