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# FRUIT DETECTION USING IMPROVED K-MEANS ALGORITHM

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**Abstract**
Robots can be used for plucking fruits from trees and hence the fruits are needed to be differentiated. The image processing techniques like the edge based and color based detection are used for classifying pictures captured. The planned work involves the identification of fruit with relevancy the center of mass position. The k-means algorithmic program is employed to classify the fruits from akin to leaves and branches. The known center of mass position is employed to pluck the fruit by the automation. This study supports the identification of matured fruits based on the color based segmentation.

**Keywords:** K-means algorithm, Fruits Detection, Clustering-based and Color-based


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## INTRODUCTION

Modern agricultural science and technology are extremely advanced. The worth of fruit depends on the standard of fruit throughout that we tend to have an interest solely to the defected of the image. The region-based mostly image segmentation methodology uses the similarity of pixels inside a district in a picture. Generally, a hybrid methodology incorporating the region based mostly and edge-based ways are proved to be helpful for a few applications. The seeded region growing methodology was the primary region growing method. Bunch based mostly image segmentation ways are used by several researchers [6],[7],[8],[9]. The segmentation methodology incorporating a variety of approaches faces many difficulties once computing the number of clusters that are present within the set of features or extracting the suitable feature.

The K-means clustering algorithms produced an enhanced accuracy with reduced time complexity. The improved algorithm outperforms with minimum time spent by maintained the quality of the image captured. The influenced fruit parts are also identified through this technique. The edge and color based segmentation methods are most suitable for many fruits detection algorithms [5].

## RELATED WORK

In [1], the authors have done various processes like segmentation, feature extraction, and classification. The fruits and vegetables are having features like color quality, supported color, texture, size, form, and defects. The research compared different algorithms for checking the quality of fruits and vegetables. After preprocessing, image segmentation is required which separates processing technique form the cluster based on similar characteristics of pixel and classified. In agriculture, mainly the computer vision system and image processing are booming nowadays. They play as a vital analyzing technique for pre to post gather of crops. The authors highlighted the use of image processing as well as the computer vision field for food business and agriculture. They have identified the quality characteristics of agricultural merchandise are size, color, shape, texture, and defect. They have implemented a computer vision system which offers authentic, evenhanded, and non-destructive rating.

In [2], the authors have located the fruits on the tree which is one among the most important necessities for the fruit harvest. To discover the fruit, a picture process algorithmic program is trained for economical feature extraction. The algorithmic program is meant with the aim of assigning different weights for options like intensity, color, orientation, and the edge of the input check image. The weights of various options represent the approximate locations of the fruit inside a picture. The input pictures are the section of the tree image. The authors claimed that their approach can be applied for targeting fruits for robotic fruit harvest home. The developed algorithm is not domain specific and also imposes certain limits.

In [3], the authors presented the intelligent fruit identification and detection methods and discussed the merits and weaknesses of every methodology. The support vector machine (SVM) was used as a powerful tool in ancient classifiers. Their study has described many pattern recognition strategies from a series of articles for establishing fruit data. This paper is found to be an effective approach and many researchers have extended their ideas based on this paper. Moreover, this paper provides a way of applying pattern recognition strategies in different fields contains a bright future.

In [4], the authors have explained how pattern recognition and shape matching are important which are defined as the basis of measuring similarity among many shapes and its use for shape comparison. These options were then used inside a CRF framework and were shown to outmatch previous work. They achieved spectacular segmentation performance, however, they didn't perform object detection. Numerous image processing techniques have been developed and useful during the analysis of various images in the agricultural field for identifying crop diseases, examining crop ripeness, and detection of fruit and vegetables.

## PROPOSED MODEL

The outline of the proposed system is given in Figure 1. The various steps involved are explained as follows:

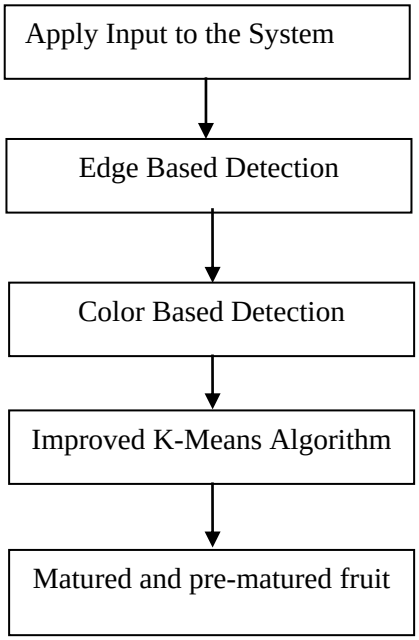


**Fig. 1 Outline of the proposed model**

**Edge-based detection**

The edge options refer to the method of known fruits detection image where the element intensity that characterizes the boundaries of the fruits image. Computer edge in an image can be identified using Canny edge detection algorithm. In that algorithm, the pixels are used to mark the edges, non-edges or intermediate. This can be done with the support of preprocessed images and identified features are further processed to detect the objects of various shapes.

**Color-based detection**

The images of fruits on tree are edge identified and given into color model before fruit plucking where the fruits need to be differentiated. The matured fruits are differentiated by the color primarily regardless tiny or massive fruits size. Segmentation can be useful for color identification and fruit detection using image segmentation for processing and analysis of images.

**Improved K-Means algorithm**

There are several cluster-based approaches are proposed. Here, k-means rule is employed to classify the fruits from other objects such as leaves and branches. The rule can categorize the things by means of similarity. To calculate that similarity, the geometrical distance is used as measuring. Here, the K-means algorithm begins with an initial set of randomly chosen centroids, which serve as starting points for each cluster, k-means is one of the simplest clustering-based algorithms.

$$J(V) = \sum_{I=1}^{C} \sum_{J=1}^{Ci} ( \| x_i - v_j \|)^2$$

where,

'$||x_i - v_j||$' is the Euclidean distance between $x_i$ and $v_j$.

'$C_i$' is the number of data points in $i^{th}$ cluster.

'C' is the number of cluster centers.

The performance of k-means clustering is predominantly based on the initial number of clusters chosen. As in [10], Nobuyuki Otsu threshold adaptive threshold method is used to choose the optimal number of initial clusters. Definitely, this improved K-means supports better fruit identification.

**CONCLUSION**

The system works extremely quickly and any image format can be used. The user will simply perceive from graphical output illustration. This work can be used for prediction of matured and pre-mature fruits.

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