Detection of Banana Grading Stages Using Image Processing and Machine Learning

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Abstract- In order to determine the stages of banana ripening based on colour, the appearance of brown spots, and picture texture data, a computer vision system was put into place. For classification purposes, photos of bananas with their L*, a*, b* values, brown area %, number of brown spots per cm2, homogeneity, contrast, correlation, and entropy of image texture were employed. The results demonstrate that a straightforward classification system can detect the phases of banana ripening just as well as professional visual perception, despite variances in data for colour and appearance. 150 banana samples could be classified with 96% accuracy into the three phases of ripening using the L*, a*, and b* bands, brown area percentage, and contrast. Potential applications of computer vision Online banana ripening stage forecast.

Key words: banana ripening, computer vision, colour, appearance, categorization

I. INTRODUCTION

In Indonesia, bananas are a common fruit variety. This fruit is simple to locate because it is offered in a variety of settings, including little booths, traditional markets, and contemporary markets. The mult banana is one of the varieties of banana that is most frequently found in Indonesia. Small in size, the muli banana (Musa acuminata Linn) measures 9 cm in length and 10.5 cm in diameter. The fruit has a golden fruit peel, a sweet and aromatic flavour, and a high concentration of vitamins, minerals, and carbs. Bananas are frequently consumed and grown as a result of their many advantages[1]. The sorting process is one of the post-harvest issues with large-scale fruit goods for the distribution procedure that follows[2]. The process of transforming photos into the appropriate digital image data in order to extract particular information is known as image processing [3]. Image processing refers to a strategy or approach for processing photos or images by modifying the chosen image data to get accurate information. Processing a picture is made simple by image processing software. Utilising tried-and-true image processing technologies helps increase fruit ripeness sorting accuracy. For the categorization of fruit ripeness, image processing has been used in a number of studies[4],. A system for automatically evaluating oranges is suggested in reference [5] utilising a pattern recognition technique applied to a single colour photograph of the fruit. The second study in the fruit that Opena and Yusiong grasped, which was fully ripe.

one method of image processing used to determine an image's colour space variation in a certain colour coordinate system [9]. The RGB basis is useful for presenting colour information, but it cannot be used for programmes that process images. By setting a threshold value in the hue range (spectrum wavelength) that the item is surrounded by, object identification software may more easily detect objects with different hues [10],[11]. The search system will run more quickly since the HSV colour space is incredibly efficient and uses the most comparable photos for colour extraction. The HSV colour space is fairly similar to what the human eye sees. In comparison to the saturation/value component, the hue component is more significant In comparison to other colour spaces, HSV colour feature extraction performs better [12].

The research used the well-known kNN algorithm because of its many benefits. Objects with high dimensions can be used with KNN. Particularly for geometric learning[13], the data represented is easily applied and has a basic form. Of all machine learning methods, the Nearest Neighbour algorithm is the most straightforward. The idea is to memorise the training data and use that information to predict the class/level

of each new instance based on the class of its close training data neighbours. The approach is predicated on the idea that the attributes used to characterise a point domain are pertinent to labelling to increase the likelihood that nearby points would share the same label or class.

In various circumstances, Finding the closest neighbours can be completed extremely rapidly, even in the presence of a large amount of training data[14]. The kNN method is often used for categorization in several industries. The detection of natural deficiency levels in plants[11], the detection of animal tracking systems[7], the detection of pesticide residues[10], and the classification of orange varieties[9] have all been accomplished using the simplest and most accurate methods. These include the kNN algorithm. Based on the preceding description, the research suggested a straightforward categorization for the maturity degree of banana fruit using the kNN algorithm. The HSV colour space was chosen for the extraction procedure because it performs better than other colour spaces.

II. OBJECTIVES

The primary target of the paper is to distinguish and portion the banana evaluating in the given picture.

- Load RGB picture
- To upgrade the item, picture improvement is finished utilizing in adjust with thresholding.
- convert the picture into L*a*b* Variety Space.
- To fragment the pictures in light of the grouping technique (Kmeans).
- Highlights like factual and textural highlights were separated utilizing GLCM, variety movements,skwness,ketrosis utilizing
- To make the division of the pictures more straightforward.
- To recognize the sort of imperfections in the apple utilizing KNN classifier.
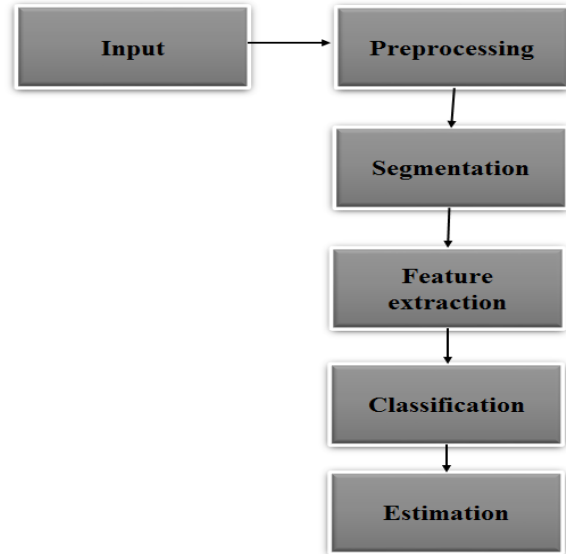
III. BLOCK DIAGRAM

a)   SYSTEM ARCHITECTURE:

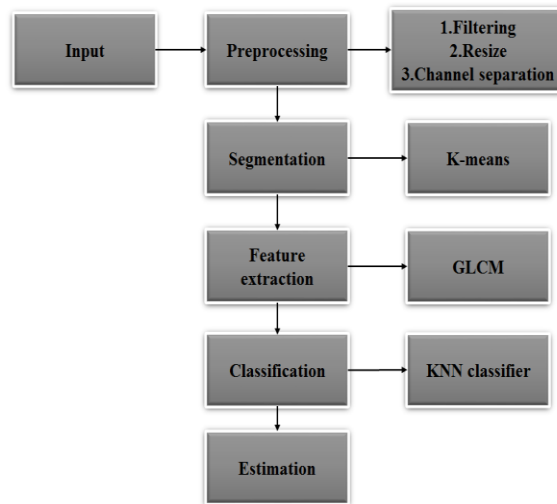Fig1.System Architecture

b)   FLOW DIAGRAM:

Fig2.System flow diagram

IV.HARDWARE AND SOFTWARE REQUIREMENTS

a)   HARDWARE REQUIREMENTS:
- Core mi3– 2.7 GHz
- 2GB DDR RAM
- 250Gb Hard Disk
-
b)   SOFTWARE REQUIREMENT:
- Operating System : Windows 7
- Tool : Matlab
- Version : 2018

MATLAB® is an undeniable level specialized

registering language and intuitive climate for calculation improvement, information perception, information examination, and mathematical calculation. Utilizing MATLAB, you can tackle specialized figuring issues quicker than with customary programming dialects, like C, C++, and Fortran.
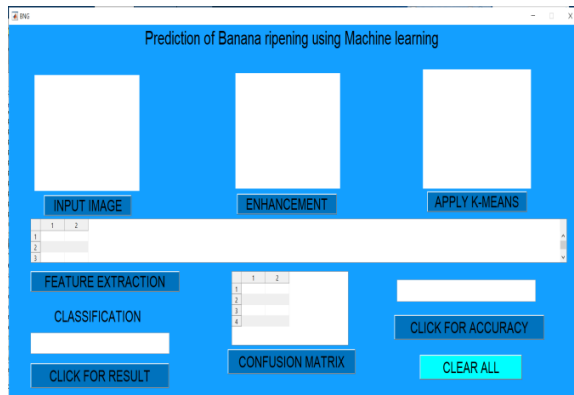
V.RESULTS

Fig 3. Application designed for detection of Banana Grading Stages
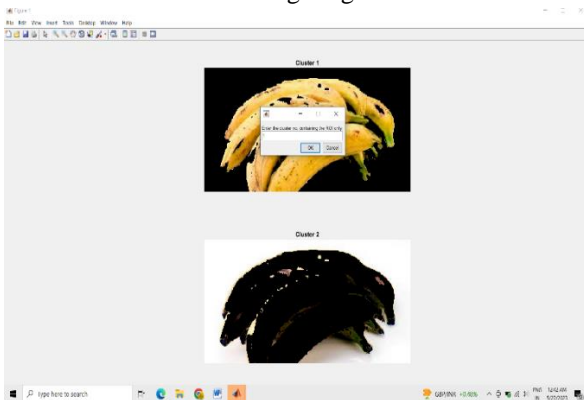

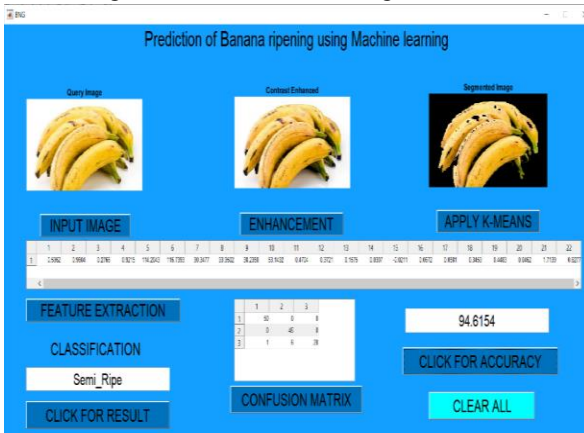Fig 4.Selection of ROI using K_means

Fig 5.Classification of banana grading images with accuracy

VI.CONCLUSION

Sample images of apples and bananas were alone taken for experimentation, in future few more fruits or vegetables can be taken as samples for experimentation. Images having white background alone can only be considered for testing this algorithm using KNN classifier. Sample images should be acquired at 360 degrees in order to obtain 100% accuracy in real time classification of any fruit or vegetable in the agriculture industry. Thus a machine vision system for segregating/classifying apple fruit and banana fruit was developed and tested for 96% accuracy and the same was obtained.

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