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AUTOMATIC FRUIT SORTING SYSTEM USING RASPBERRY-PI

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Abstract:

The process of arranging items systematically is called sorting. Manual sorting of fruits is preferred at the wholesale market and food processing industries based on different parameters such as size, shape, quality, etc. But it is a time-consuming, less efficient, and inconsistent method. The existing systems in the market can sort single fruit with single or multiple parameters. To replace this traditional sorting way, the proposed system presents an automatic fruit sorting mechanism with an image processing technique and classification algorithm. It recognizes and classifies two different fruits with two different feature analysis method i.e. quality and size-based analysis at a time.

Keywords **– Sorting, image processing, KNN Classification.**

I. INTRODUCTION

To improve quality and production efficiency, reduce labor intensity, it is required to make a system for automatic sorting of fruits. For the detection of fruits different technologies are present, out of that image processing techniques are more efficient. At today's date quality of fruit, color, size, and so on not possible to sort on the same line traditionally.

To overcome this problem, the proposed system is designed. The system is integrated with mechanical assembly and embedded devices like single-board computer Raspberry-Pi. Images are the most important data for image processing. Whenever fruit placed on conveyor belt image is capture by the camera module. In image processing, the KNN classifier classifies fruit by different classes. This image is processed through the training and testing section. With the help of servo motor according to class fruit will slide from the conveyor belt. Using different hole of different measurement fruit is the sort with size.

II. METHODOLOGY

India produces 44.04 million tons of fruit annually. Several sensors primarily based on optical characteristics at near-infrared levels are used along with the spectroscopic method for grading fruits. Fruits kept in piles and stock houses need more sophisticated robotics manipulators for in-house inspection. The reading obtained from sensors or the inline cameras is feed for image processing methods and algorithms for grading [1].

A system wherein a sensor unit was developed and used to detect and display the complete freshness status of fruit. The basic concept and technologies associated with a computer vision system and automatic based technology used in image analysis [2].

The research work for automated grading of Oranges using pattern recognition technique applied to a single color image of fruit. Four features are used to classify oranges into four classes according to maturity. Linear regression-based techniques can explicitly predict the maturity of orange [3].

According to data obtained from the size and color determination, damage, blemish, sugar containment, density and weight analysis can be done over apple. They developed certain rules to determine quality, size, packaging, etc. Feature with lower and upper limits. Results are quite successful with a machine vision-based system [4].

Image texture is a set of attributes that gives information about the image color or intensity. It is the one way that can be used to help in the segmentation or classification of images. To analyze an image texture in computer graphics there are two ways approach issue structural approach and statistical approach [5].

The system analyses method of auto-harvesting, categorization of fruit accurately and efficiently. Images preprocessed to separate foreground and background. Texture feature from Grey-level Co-occurrence matrix (GLCM) and statistical color features extracted from the segmented image. The support vector machine (SVM) model is used to train the data [6].

2.1 Block Diagram and Description

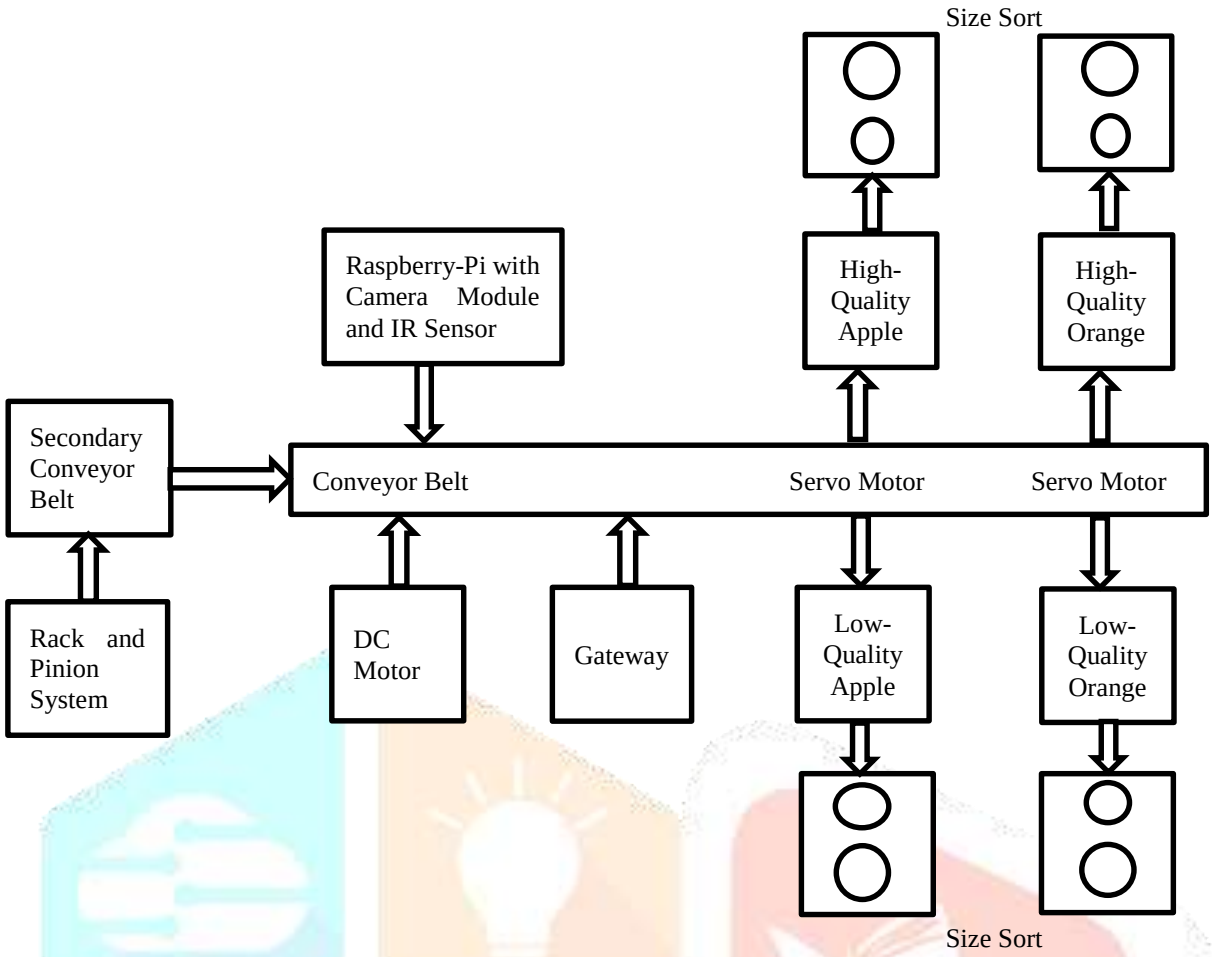

Figure 2.1: Block diagram of the automatic fruit sorting system.

Figure 2.1 shows a diagram of the automatic fruit sorting system. The proposed system uses raspberry-pi as a brain of it. The system consists of wooden structures and mechanical assemblies like rack and pinion, conveyor belt, and gear system for moving the fruit on a conveyor belt. IR sensor act as an obstacle detector when fruit passes through it. DC motor gets stop and the gate is closed by servo motor. Pi- Camera captures the image which is analyzed with different image processing techniques like edge detection, image segmentation, etc. and K nearest neighbors i.e. KNN algorithm to classify it as high-quality apple or orange and low-quality apple or orange. After completing the analysis, the gate is open and we come to know the quality of it. DC motor is starting and according to this result, the servo motor operates to slide the fruit to the respective side. On both sides of the conveyor belt, circles are made with different diameters for sort fruit according to size.

III. SOFTWARE DESIGN AND FLOWCHART

The software for the proposed system is based on image processing techniques. One of them is image segmentation, which makes a group of similar intensity pixel which separate the image into foreground and background. With the help of this we make the region of interest. Edge detection is the type of discontinuity segmentation.

3.1 KNN Algorithm

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. This is the simplest case. Suppose P1 is the point, for which label needs to predict. First, find the k closest point to P1 and then classify points by majority vote of its k neighbors. Each object votes for their class and the class with the most votes is taken as the prediction. KNN has the basic steps which are to calculate distance, find closest neighbors, and vote for labels KNN performs better with a lower number of features than a large number of features. Figure a,b, and c shows the steps of the KNN algorithm.

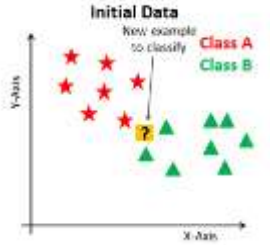

Figure a: Initial Date.

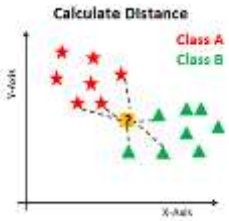

Figure b: Calculate Distance.

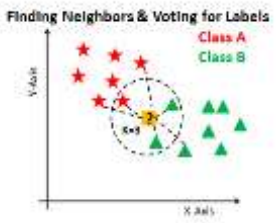

Figure c: Finding Neighbors.

Figure 3.1: KNN Algorithm.

3.2 Flowchart

The system works according to the following flowchart.

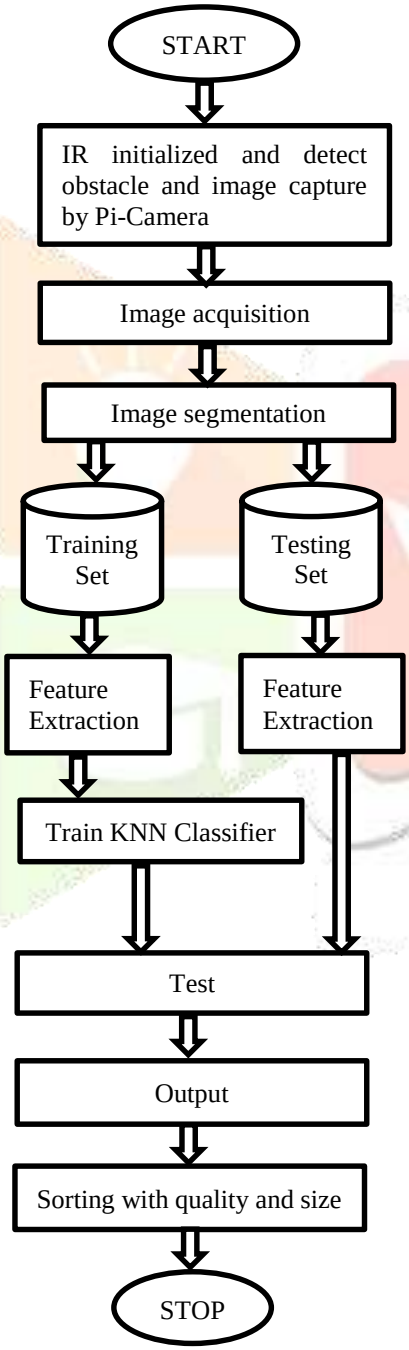

Figure 3.2: Flowchart.

IV. CONCLUSION

This paper 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 of all this via IoT.

V. REFERENCE

[1] R. Swarna Lakshmi, B. Kanchanadevi 2014. "Review of fruit grading systems for quality inspection". IJCSMC, Vol. 3, Issue 7, 615-621

[2] Krithika Jayasankar, Karthika B, Jayashree T, Deepalakshmi R, Karthika G" Fruit Freshness detection using Raspberry Pi" International Journal of Pure and Applied mathematics Volume 119 No.15 2018, 1685-1691

[3] Jyoti Jhawar "Orange Sorting by Applying Pattern Recognition on Colour Image" International Conference on Information Security and privacy(ICISP2015),11-12 December 2015, Nagpur, INDIA.

[4] Güray Tonguc, Ali Kemal YAKUT " Fruit Grading Using Image Processing Technique" article January 2009

[5] Trupen Meruliya, Parth Dhameliya Image Processing for Fruit Shape and Texture Feature Extraction – Review International Journal of Computer Applications(0975-8887) Volume 129- No 8, November 2015.

[6] Susovan Jana, Saikat Sasak, Ranjan Parekh "Automatic Fruit Recognition From Natural Images using Color and Texture feature" 2017 Device for Integrated Circuit(devIC) 23-24 March 2017 IEEE India.

[7] Manali R. Satpute and Prof. Sumati M. Jagdale "Color, Size, Volume, Shape and Texture Feature Extraction Technique for Fruits – a review: IRJET Volume 3 issue 4 Apr 2016.

[8] Woo Chaw Seng and Seyed Hadi Mirisaee. "A New Method for Fruit recognition System" 978-1-4224-4913-2 / 2009 IEEE

[9] Seema, A. Kumar, and G.S. Gill. "Automatic fruit grading and classification system using computer vision – A review" 978-1-4799-1734-1/2015 IEEE