Machine Vision Technique Based Smart Fruit Sorter

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Abstract -- In large scale food production industry, the grading of fruits take place a major role. In this paper automatic grading of artificial mango is done according to artificial ripening and natural ripening. In terms of texture, shape, size. The proposal scheme work based on Machine learning technique for grading of mangoes in two different categories, they are natural ripening and artificial ripening. In this system images captured by Raspberry pi V2 camera. Several processing techniques are applied to collect features that required for grading of mangoes. For grading prediction, we are using Convolution Neural Network (CNN) algorithm in Machine learning technique. The proposed system for grading of mango fruit is nearly 92%. Moreover, the repeatability of the proposed system is found to be 100%.

Indexed Terms: CNN algorithm, Machine learning, Raspberry pi

I. INTRODUCTION

is popular fruit, due to its flavor, taste, and nutrition value. Mango trees are cultivated in different favorable regions. During summer mangoes are harvested from gardens and then transported to various markets by distributors. The variations become much wider due to variation in variety, location and weather condition at the time of harvesting. The grading of mangoes is thus an essential step; however it is a tedious job and it is difficult for the gardens to maintain constant vigilance. If this task could be performed automatically by machine vision, the result would be more objective; it would also save labor and enhance output.

In past, much research work has been carried for automated grading of fruits through analyzing aroma using electronic nose, in order to estimate the ripeness of fruit. Recently peach maturity prediction has been performed by estimating the fruit flesh firmness using multivariate retrieval techniques applied to reflectance spectra acquired with the spectrometer. These works of fruit grading mainly involves maturity estimation, through non-vision based system, these methods also have limitation in grading of fruits in mass scale within limited time frame.

Machine vision system have been proposed for large scale grading applications. This method is used to identify natural ripening and artificial ripening of mangoes. No such system still proposed for prediction of actual-days-to-rot, which is very essential during transportation of the fruit. However, all these presented methods are developed to detect the artificial and natural ripening for sorting the fruits.

II. PROPOSED SYSTEM

A. Block diagram:

The block diagram of the proposed the system is shown in Fig.1.Our proposed system acquires inputs from Raspberry pi camera which detect the mango. These acquired inputs are conditioned and provided to the Raspberry pi unit which processes this image.

The algorithm (CNN) in the Raspberry pi predicts whether the mango is artificially ripened or naturally ripened. In this proposed system we use this command “rapistill_0cam.jpg” to capture the image. Now the captured image is processed and it gives the output whether the mango is artificial or natural ripped mango.

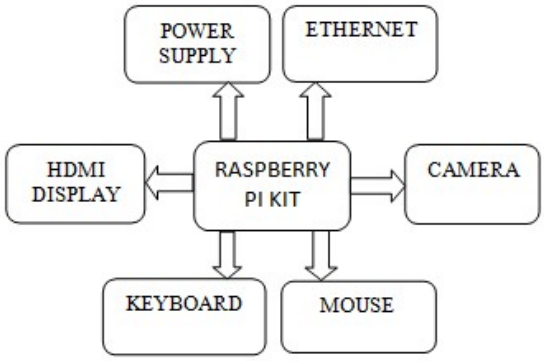

Fig. 1: Block diagram of proposed system

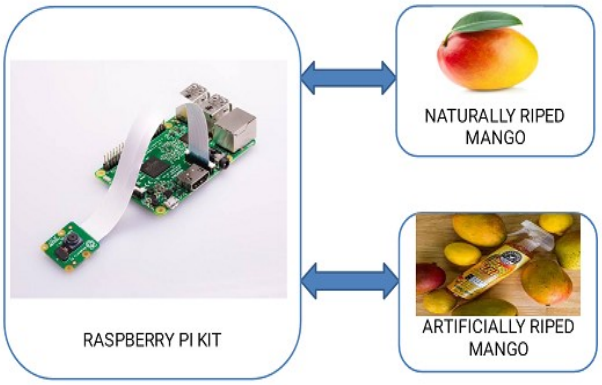

Fig. 2: Use Case of proposed system

B. Experimental Setup:

The proposed system was developed using the Raspberry pi 3 model B. Connect the Raspberry pi to your router using the Ethernet cable, and plug in the micro USB charger, which will start the Raspberry pi booting. The Raspberry pi consist of BROADCOM BCM2837 64 bit Quad core, CPU at 1.2 GHZ, 1GB RAM camera ports, MicroSD card slot, DSI display port, CSI camera port, micro USB power input, 40 pin extended GPIO (General Purpose Input Output), 400 MHZ video core IV GPU, 1080p HDMI (high definition multimedia interface), 4 pin power of Ethernet, dual band 802.11ac wi-fi, Bluetooth 4.2 and 4* USB 2 ports. The environmental setup for the developed system is shown in Fig 3. The work was prototyped and Raspberry pi camera considered the high quality sony IMX219 image sensor itself has a native resolution of 8 megapixel and has a fixed focus lens on board. In terms of still images the camera is capable of 3280*2464 pixel static images and also supports 1080p30, 720p60 and 640*480p90 video. HDMI which used to transmit both audio and video digital data. Raspberry pi comes with two first rate connectors on board. One is between ETHERNET and HDMI and other is near GPIO. The one closer to Ethernet connector is Camera Serial Interface (CSI).

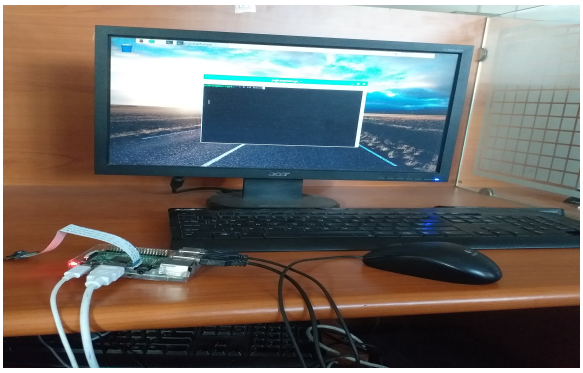

Fig. 3: Environmental setup of proposed system

III. RESULTS AND DISCUSION

A. Test Case:

The proposed system was prototyped and tested. The system was validated using various test cases.

Test case: Input is taking from camera and processing is done then the output for artificial and natural ripened mango is show with accuracy.

Test case of proposed system in shown in Fig.4

Fig. 4: Test Case

IV. CONCLUSION

In this research we built a proposed model of a mango fruit sorting system including both hardware and software .The hardware includes RASPBEERY PI and CAMERA. The algorithm includes Inception V3.The inception v3 analyze the image and convert into the text format. Machine vision based fruit sorting systems are capable of replacing labor work for inspection of fruit sorting. Out of morphological,

color, texture and features, morphological provided more accuracy rate. But in machine learning techniques, Deep learning with Tensor flow and inception v3 model gives highest accuracy and shows the best result of these techniques.

V. FUTURE WORK

In this research we use images and in future we use video for processing.

The overall approach has been shown to have great potential in industrial and horticultural applications for the realization of easy-to- use automated maturity sorting systems to be employed by non-expert users directly in the warehouse.

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