AUTOMATED CAPSICUM SEGREGATION MACHINE

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ABSTRACT:

Grading agricultural through manually sorting them is a very costly, difficult, and time consuming in the quality control process. Compared with traditional methods, computerized inspection of food products is more cost effective, sustainable, and efficient. Due to high customer demand for safe and high quality products and due to the significant theoretical and practical developments in image-processing techniques in the past few years, A system is introduced for separating the capsicum based on the rottenness, color and size in the Capsicum by image-processing technique where the pictures taken by a digital camera are preprocessed in the Mat-lab environment. Subsequently, a new technique is introduced for identifying the rottenness, color and size in the Capsicum.

I. INTRODUCTION

This project deals with the design and development of an automated system for capsicum segregation. The image of the capsicum is captured by a Camera, the Rottenness and Color is found by analyzing it in a software following which it is sorted, and for Size based separation, conveyor belt basement rod size increased depending upon the area of the capsicum. This process of automation in the agriculture will reduce manpower for segregation process during the harvest time. Implementing at a larger scale can be profitable. This method can also be tailored for sorting other vegetables like tomato, lemon, and other fruits and vegetables based on Rottenness, Color, and Size. Among many Automation in agricultural sectors, segregation and sorting of the vegetables are unproductive to employ the human labors. This process can be automated with current technologies such as Image processing Techniques. The world area and production of chilli is around 1.5 million ha and 7 million tonnes respectively. In Asia, India, China, Pakistan, Indonesia, Korea, Turkey and Sri Lanka. The bulk share of chilli production is held by Asian countries. India is not only the largest producer but also the largest consumer of chilli in the world. Chilli is the most common spice cultivated in all States and Union Territories of India contributing about 36% to the world total production. India is not only largest producer but also exporter of capsicum in the world, after China. In India, it is grown practically all over the country. In India, capsicum is cultivated over an area of 0.81 million ha during 2010-11 with an annual production of 1.22 million tones green capsicum (Anonymous, 2011). capsicum occupies number one position in export of spices with 2,09,000 metric tons volume worth Rs. 1097 crores (Anonymous, 2009). Another important export component of the Indian spice export is value added production like oils and oleoresin with Rs. 563 crores for which the major share of the raw material used is capsicum and hence in the recent year, capsicum is gaining greater importance in global market. India is the largest exporter of capsicum and about 2.5 to 3.0 % of country's total production is exported. Andhra Pradesh and Karnataka account for 75% of the country's net area under capsicum and its production. At present, Karnataka ranks second in area (0.1322 million ha) and production of capsicum (0.148 million tons) and is being extensively cultivated in Dharwad, Haveri, Belgaum, Gadag, Bellary, Gulbarga, Chikkamagalur and Raichur. Karnataka state currently possesses 10 to 15 varieties and produces about 10 varieties of capsicum which contain different ranges of colour, pungency, size and shape. The main varieties grown in Karnataka are namely Byadagi Kaddi, Byadgi, Guntur.

II. OBJECTIVES-

Capsicums are offered to the market in many different varieties and also in a wide range of irregular shapes. We work to meet capsicum processing requirements with customized technologies designed to suit the shape of the product. Together with segregation, We set ourselves three objectives in particular:

1. Removal of Rottened Capsicums.
2. Precision sorting based on size.

3.   Good color Selection.

The main objective of this project is to design an Automated Machine for Capsicum segregation, on its Rottenness, Color, and Size at a rate which can be afforded by the farmer. With the help of this machine the manual segregation method will be replaced by machines. This helps in saving time, labour cost and has many other advantages.

III.   PROBLEM DEFINITION

Grading agricultural through manually sorting them is a very costly, difficult, and time consuming in the quality control process. Compared with traditional methods, computerized inspection of food products is more cost effective, sustainable, and efficient.   In order to export the capsicum to other countries due to high demand.so it is necessary to separate the capsicum based on the requirement.so we are presenting the machine to segregate based on the Rottenness, Color, and Size.

IV.   DIFFERENT TECHNOLOGY

Dah-Jye Lee [1] introduced a system based on direct colour mapping. They have presented a new colour mapping concept of converting 3-D colour spaces to 1-D colour indices for automated colour grading. This method does not use machine learning algo. or artificial intelligence techniques. Their approach is based on the use of a third order polynomial to convert 3-D RGB values into a simple 1D colour space. In this system, the overall grading result based on both colour index and consistency averages are found to be consistent with human grading systems. Unlike other various colour grading techniques used this approach helps to makes the deciding selection and many adjustments of colour preferences much easier. In this system the user can change colour grade thresholds as per the colour perception of human just by sliding a cutoff point present to include or exclude the fruits that are slightly darker or a bit lighter green or medium red. This method is simple, effective and gives high accuracy which is of 95% for 2118 samples.

Sudhir Rao Rupanagudi [2] introduced a maturity grading system for tomato which is cost effective. This setup utilizes inexpensive materials and six important stages of tomato ripening are identified by image processing algorithms. The prototype consists of a box made of thermocole which is enclosed on all sides. A small slit is made on top of the box to allow the farmer to place the tomatoes. Within the box, a platform is provided, on which the tomatoes are placed. Directly opposite to the platform, a computer camera (web camera) is fixed which focuses on the fruits under consideration. Simulink was used to design all algorithms which is a part of MATLAB 2011b on a 2.5GHz CPU. An overall 98% accuracy was achieved with respect to maturity grade detection and greater execution speed was obtained. They used YCbCr colour space. Six Grades of tomatoes were identified with 98% accuracy for 50 trials.

Monika Jhuria [3] introduced a system based on a neural network concept. For extracting the features of each image color, morphology and texture features vectors are used. This mapping is done by using Euclidean distance concept. Two fruits namely apple and grapes have been used for research in this paper. Selected infected diseases are Black Rot and Powdery Mildew. For Apple are Apple Scab and Rot. Color, morphology and texture three feature vectors are used for feature extraction of learning database images. HSI color space is used here. In each plane, boundaries of all database images are obtained by using erosion concept. In this operation, the states of any input pixel in the output image is calculated by applying the rule in which the values of the output pixels are the minimum values of all the pixels in the input pixel's neighborhood. 92 images were used for learning of system and accuracy obtained was 92%.

V.   HARDWARE AND SOFTWARE COMPONENTS

Raspberry-pi

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote teaching of basic computer science in schools and in developing countries, the original model became far more popular than anticipated, selling outside its target market for uses such as robotics.

Rasberry pi-3

Display

The Raspberry Pi Touch Display is an LCD display which connects to the Raspberry Pi through the DSI connector. In some situations, it allows for the use of both the HDMI and LCD displays at the same time. the DSI display is designed to work with Raspberry Pi models that have mounting holes in a HAT footprint. Model A/B boards are supported, but require additional mounting hardware to fit the HAT-dimensioned stand-offs on the display.

Rasberry Pi   7" LCD DISPLAY

Conveyor belt

The belt conveyor setup is a set of conveyor belts and its driving systems which receive the Capsicum from the vibrating conveyor assembly. The main purpose of this belt conveyor is to deliver the Capsicum form the vibrating conveyor assembly to sorting system and after sorting out the red Capsicum from the green ones, the remaining Capsicum are delivered to a separate container by this setup.

Conveyor Belt

Motor- Servo motor

The servo motor consists of three components: a motor, an encoder and a driver. The driver compares the positioning command and position/speed information from the encoder and controls the drive current. The servo motor always detects the motor status with the positioning/speed information from the encoder.Even if the motor stops, the servo motor outputs the alarm signal to the controller so that you can detect the abnormalities. The servo motor must adjust the control type parameters according to the rigidity of mechanism and load Conditions; however, the real-time automatic tuning has made year.

VI.   METHODOLOGY

Infeed or Tipping   Ensures a gentle passing of the capsicums into the conveyor, using a Mesh like conveyor or Roller eliminator under sized Capsicums are redirected before they reach the grader. Sorting and Grading Reduces the labor requirements and provides you with unparalleled sorting consistency and accuracy. Weighing Size separation maximizes profits and delivers unsurpassed accuracy by meeting pack specifications. Colour Software enables intuitive Recognition of capsicums and adjust segregation accordingly. Initially the Capsicum is sent into the U-shaped tunnel, then it is passed into a Conveyor belt arrangement where the capsicum images are captured by the camera and compares with the given database. The processing Unit consists of Camera, Rasberry-pi module, Servo Motor, Hydraulic cylinders, conveyor belts.For capturing input image, take lights-off image and lights-on image and extract foreground produce from background. Make histogram of color features, texture features, shape features, and size features; concatenate them to compare with database for final output. After analyzing Image the system complete the feature integration. Next it defines specific class properties according to feature and Create a database of different class. Then the system starts comparison with the input images. Test input image, which class it fits in. Then the capsicums are segregated based on its Rottenness, Color, Size.

VII.   TECHNIQUES INVOLVED IN THE PROJECT

- Removal of Rottened Capsicums.
- Sorting and Grading.
- Color segregation.
- Python programming.
- Machine learning.
- Image Processing

VIII.   WORKING

Capsicum Sorting process with the Automated Capsicum Sorting machine will enable uniform selection of Colour, and Accurate grading based on the size of the capsicum.

This solution Reduces the time required to segregate the capsicums by the farmers according to the market requirements.

 Here we are presenting a method to segregate the capsicum based on its Rottenness, Color and the Size automatically.

1. Based on Rottenness-The fresh Capsicum are collected in a container and passed into next steps and the rotten Capsicum are removed.

2. Based on color- Yellow & Red is preferred as the ideal color.

The Yellow & Red color capsicums are selected for further processing. Remaining are collected back in a separate container

3. Based on Size- The machine separates the capsicum at 3 different range.

- Small

- Medium

- Big

The best required capsicum is selected based on its Rottenness, Color and Size.

Tipping

Ensures a gentle passing of the capsicums into the conveyor, using a Mesh like conveyor or Roller eliminator under sized Capsicums are redirected before they reach the grader.

Sorting and Grading

Reduces the labor requirements and provides you with unparalleled sorting consistency and accuracy.

Weighing

Size separation maximizes profits and delivers unsurpassed accuracy by meeting pack specifications.

Colour

Software enables intuitive Recognition of capsicums and adjust segregation accordingly.

Initially the Capsicum is sent into the U-shaped tunnel, then it is passed into a Conveyor belt arrangement where the capsicum images are captured by the camera and compares with the given database.

The processing Unit consists of Camera, Rasberry-pi module, Servo Motor, Hydraulic cylinders, conveyor belts.

For capturing input image, take lights-off image and lights-on image and extract foreground produce from background. Make histogram of color features, texture features, shape features, and size features; concatenate them to compare with database for final output.

After analyzing Image the system complete the feature integration. Next it defines specific class properties according to feature and Create a database of different class. Then the system starts comparison with the input images. Test input image, which class it fits in.

Then the capsicums are segregated based on its Rottenness, Colour, Size.

IX.   APPLICATIONS AND ADVANTAGES

The present machine is designed for capsicum segregation only. But separate machines can be developed for other vegetables and fruits as per requirements. The advantages of using this machine are

1. Reduces time of the separating.

2. Labor cost saving.

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