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Automatic Vegetable Recognition System

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ABSTRACT: *In this research, a new vision system to characterize the recognition of vegetables in images has been developed.It is always related to image processing, which can control the classification, qualification and segmentation of images.It is a recognition system for super market and grocery stores. From the captured images multiple recognition clues such as colour, shape, size, texture and weight are extracted and analysed to classify and recognize the vegetables. The results show that it has good robustness and a very high success. An important characteristic of the proposed algorithm is that it is able to work with several elements inside the camera field of view. This adds flexibility to the application in order to work in the country or in a greenhouse, where the elements are very close to each other and the location of all them must be obtained in real time. This approach is less complex and relatively very faster than other approach. If the system can identify uniquely, the checkout process at superstores will be fast and efficient.*

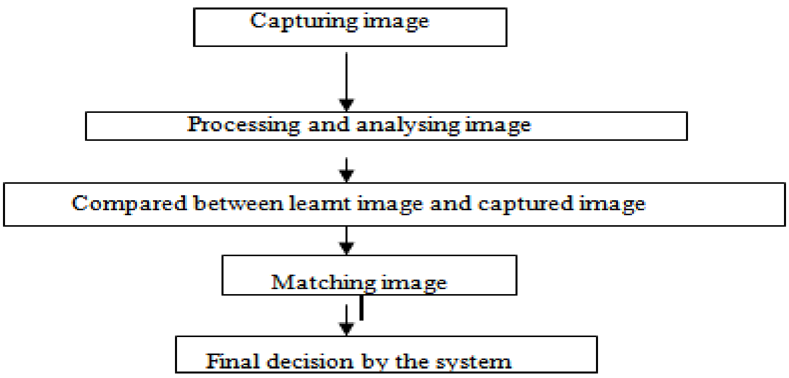
Keywords: *digital classification, image processing, histogram based database, finding children, texture classification*

I. INTRODUCTION

We present automatic recognition system (vegetable vision) to facilitate the checkout process of a supermarket or grocery stores. Vegetable vision is done with the image processing and image analyzing. Image processing is done by MATLAB. This system consists of an integrated measurement and imaging technology with a user friendly interface. When we bring a vegetable at checkout point, an image is taken, a variety of features such as color, shape, size, density, texture etc are then extracted. These features are compared to stored data. Depending on the certainty of the classification and recognition, the final decision is made by the system. Vegetable quality is frequently referred to size, shape, mass, firmness, color and bruises from which fruits can be classified and sorted[1]. The classification technique is used to recognize the vegetable's shape, size, color and texture at a unique glance. Digital image classification uses the spectral information represented by the digital numbers in one or more spectral bands, and attempts to classify each individual pixel based on this spectral information [2].

II. METHODOLOGY

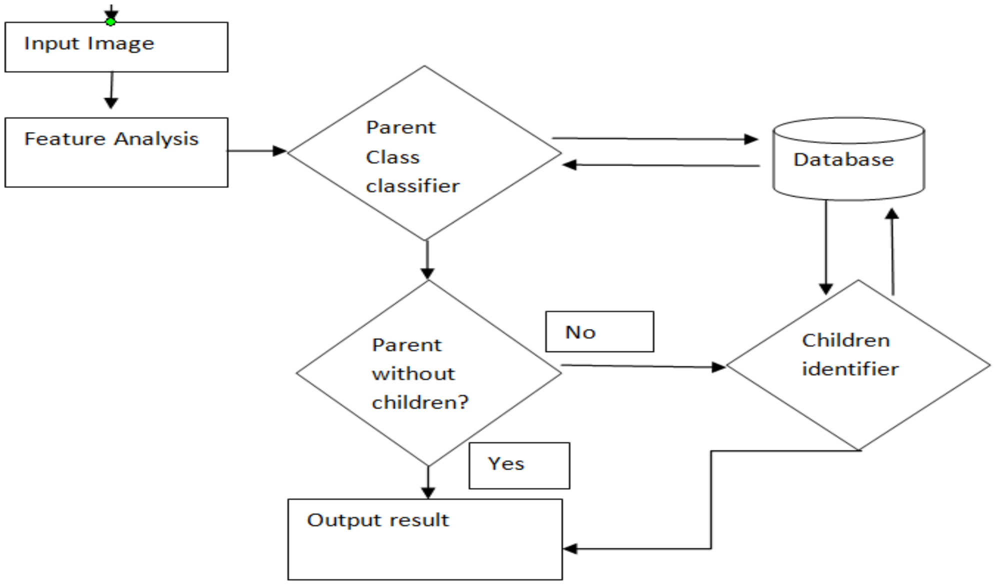
Not any single method can solve any recognition problem, we have to use number of classification techniques. The Automatic recognitions of vegetables from images can recognize, analyse and process, based on color, shape, size, weight and texture. Sometimes it is used to simplify a monochrome problem by improving contrast or separation or removing noise, blur etc by using image processing technology [3]. Our Methodology can be summarized in the learning and recognition section as followings:



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. Input images for different vegetables, in our implementation, the application had learnt cabbage, apple, zucchini, broccoli.

Fig 1.1: Flow chart of methodology[4,5]

After capturing the image, apply the following steps as in the learning process. Convert image to HSV model.



To avoid the illumination effects we must convert the image to HSV model as in the learning process that mentioned previously.

Calculate the histogram of captured image in order to compare it with stored histograms of learnt images

Compare between the histogram of captured image and each of the histograms of learnt fruit images that we stored in the array of histograms

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.

III RESULT

This project was based on color, texture, shape and size through comparing image histograms to find the best matching image. Our experimental results proved that this application shows accuracy with 96.55% of identifying vegetables, Figure 1.2 shows samples of learnt images and tested images.A histogram is a graphical representation showing a visual impression of the distribution of data. It is an estimate of the probability distribution of a continuous variable.

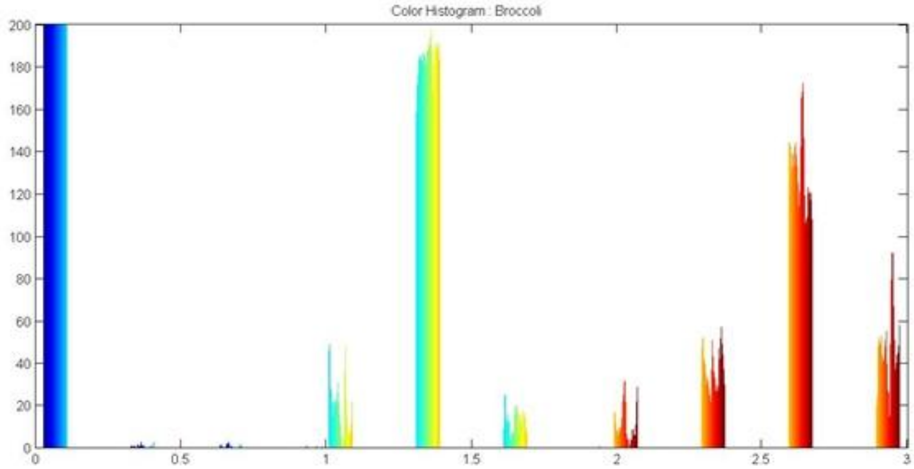


Fig 1.2: Color Histogram of broccoli for database [6].

For any given image we can Compute H, S, V histogram and recognize that image for the particular vegetable. For example, broccoli, violet cabbage. The database has all the information to indentify a vegetable from others. Figure 1.2 shows the color histogram of broccoli which is stored in the database
Now, the histogram was calculated for the given input images of broccoli. Figure 1.3 represents the tested broccoli and its color histogram

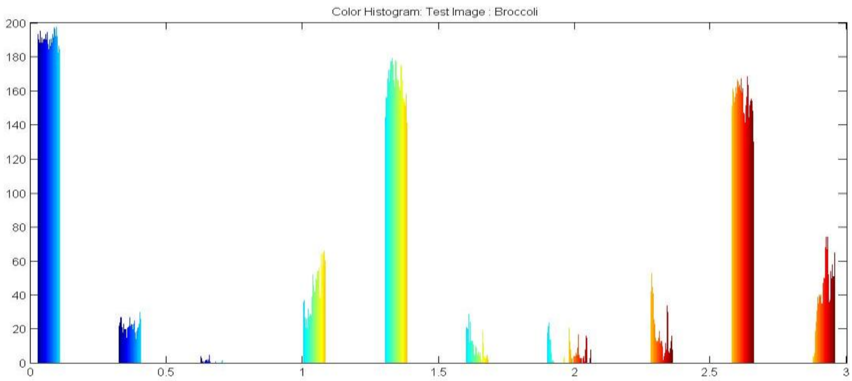


Figure 1.3: Tested broccoli and its color histogram[7]

3.1 FINDING CHIRLDREN

After detecting parent class the system goes for further classification. Texture, shape and other features are used to detect the children. Assume two samples zucchini and beans which has same color response, green (Figure 1.4). So, the system detects as green class vegetables. For unique recognition of children the system needs further classifications.For Children detection system goes for further classification. A crude solution is connected component[8,9]. In this process system uses Gray level threshold. The system throws away smaller blobs and connected component labeling. Then calculate connected component size. Figure 1.5 shows the connected component.

Figure 1.4: (a) Zucchini, (b) Beans

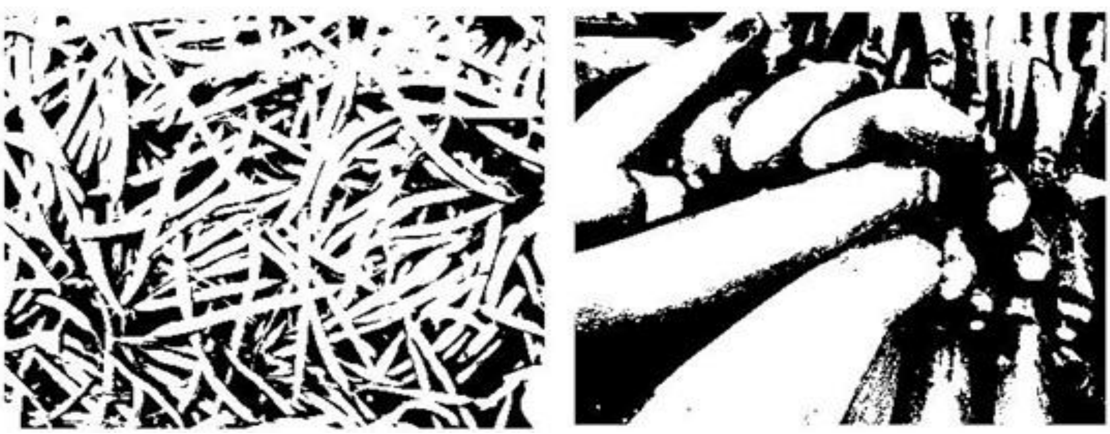


Figure 1.5: (a) beans connected component, (b) zucchini connected component[10]

Beans have larger connected component than zucchini. In figure 1.6 white areas indicates the connected component

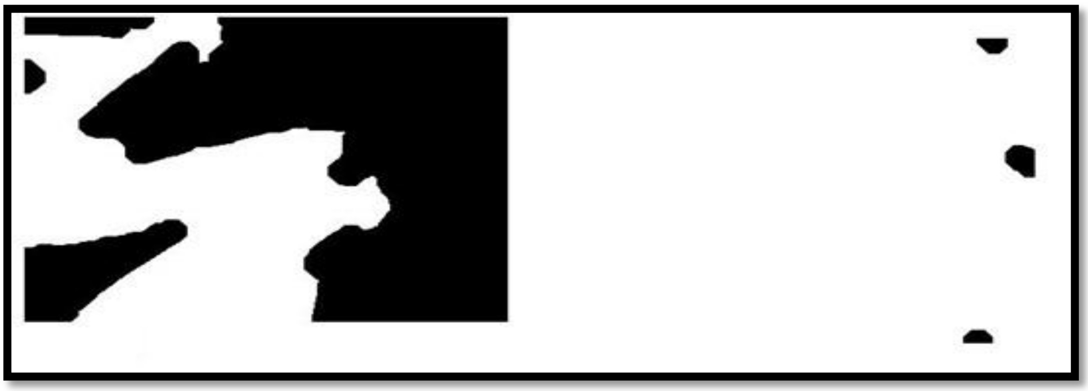
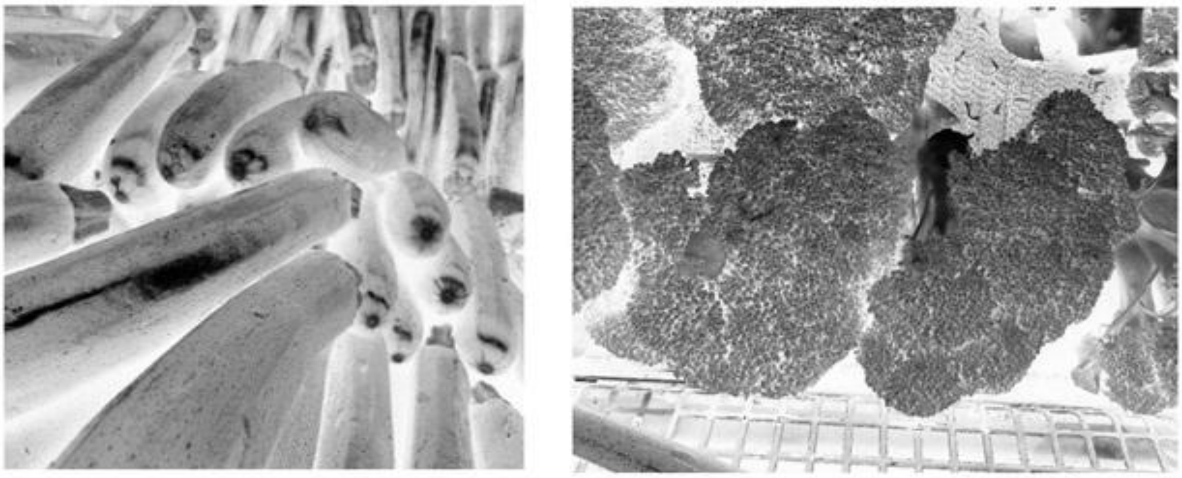


Figure 1.6: (a) Zucchini Largest connected component: white area,
(b) Beans Largest connected component: white area[6,10]

3.2 TEXTURE CLASSIFICATION

Texture based Classification to recognize parent Class. There are two samples zucchini and broccoli used for texture feature (Figure 1.7). Sometimes misclassified occur during classification for some reasons. Only color difference was calculated, other region effect, positive and negative difference, imaging setup and object orientations are the main reasons of misclassified. To solve this problem the automatic vegetable vision system does texture measuring and filtering to the input tested image of the vegetables.

Fig 1.7: (a) zucchini, (b) broccoli



Zucchini ***Broccoli***

Fig 1.8: Texture measuring of zucchini and broccoli

Fig 1.9 shows the texture measuring and figure 1.10 presents the filtering of the given images.[10,12]

Zucchini **Broccoli**

Figure 1.11: Filtering of input images of zucchini and broccoli [12].

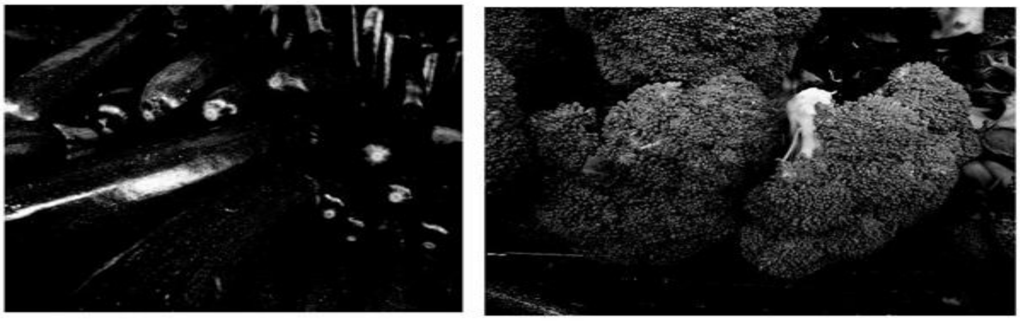


Figure 4.12: Filtered image of zucchini and broccoli

The filtered images are shown in figure 1.12. After this process the system gets a clear picture of the input. So that it can recognize the children class from the parent class accurately.

IV CONCLUSION

It is testified that Vegetable vision is an alternative to unreliable manual sorting of Vegetables. The system can be used for vegetables grading by the external qualities of size, shape, color and surface. The Vegetable vision system can be developed to quantify quality attributes of various vegetables such as mangoes, cucumbers, tomatoes, potatoes, peaches and mushrooms.

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