"SMART FRUIT GRADDING SYSTEM USING RASPBERRY PI "

Hrishikesh Thite[1] , Rushikesh Shelar[2], Akshay Thite[3], Sanket Fulkar[4] ,
Prof. Anjali Almale[5]
[1]Student, Dept. Of Computer Engineering, BSIOTR, Wagholi, SPPU, India
[2]Student, Dept. Of Computer Engineering, BSIOTR, Wagholi SPPU, India
[3]Student, Dept. Of Computer Engineering, BSIOTR, Wagholi, SPPU, India
[4]Student, Dept. Of Computer Engineering, BSIOTR, Wagholi, SPPU, India
[5]Professor, Dept. Of Computer Engineering, BSIOTR, Wagholi, SPPU, India

ABSTRACT: In previous years, several types of image analysis techniques are applied to analyse the fruit images for recognition and classification purposes .Quality needs to be defined firstly in terms of parameters or characteristics, which vary from product to product. The proposed method can process, analyse, classify and identify the fruits images, which are selected and sent in to the system based on colour, shape and size and surface features of the fruit. In this paper, we propose a web based tool that helps farmers for identifying fruit disease by uploading fruit image to the system. The system has an already trained dataset of images for the pomegranate fruit. Input image given by the user undergoes several processing steps to detect the severity of disease by comparing with the trained dataset images. First the image is resized and then its features are extracted on parameters such as color, morphology, and CCV and clustering is done by using k-means algorithm. Next, SVM is used for classification to classify the image as infected or non-infected.

Keywords— Image Processing, Color, Morphology, Color Coherence Vector (CCV), Support Vector Machine (SVM) , CNN algorithm

1. INTRODUCTION

Agriculture adds to a noteworthy segment of India's Gross domestic product. Two noteworthy issues in present day agriculture are water shortage and exact fruit grading. This project talks about the outline and advancement of a Fruit Quality Detection System using Raspberry PI and empowers remote ranch checking. Image analysis is done on captured images and Raspberry PI will take decision to which class fruit will be classified. After decision is taken by raspberry pi it will display related detail information about quality of fruit on monitor. Information indexing and retrieval is increased because of rapid growth of available multimedia contents, that's why efforts have been done on text extraction in images. The collection of images in the web are growing larger and becoming more diverse. Retrieving images from such large collections is a challenging problem in front of us. To organize and classify such large amount of images is time consuming task. Therefore it is required to design a system to organize and classify the images in a database, so that the images can be retrieve fast with little amount of time. also cover sinter active querying such as in relevance feedback approach. From the above mentioned our CBIR system is based on color, shape and texture, binary tree. The CBIR system is divided into following stages: Preprocessing: The image

is first processed in order to extract the features, which describe its contents. The processing involves filtering, normalization, segmentation, and object identification. The output of this stage is a set of significant regions and objects.

Feature Extraction: Features such as shape, texture, color, etc. are used to describe the content of the image. Image features can be classified into primitives. To implement this idea, the CBIR system is introduced. It is an automated system that searches query image in an image database and retrieving the relevant images of using similarity measure between it and every image in the image data base. It can simplify many tasks in many application areas such as biomedicine, forensics, artificial intelligence, military, education, web image searching.

Need of CBIR System there has been a growing interest in developing effective methods for content based image clustering and retrieval. This interest has been motivated by the need to efficiently manage large image databases and efficiently run image retrieval to get the bestresultswithoutexhaustivelysearchingtheglobaldatabaseeachtime. This leads to huge savings in time and money, especially in fields where the bulk of working databases are image files or any kind of media whose contents cannot be described.

2. PROPOSED SYSTEM

In Agriculture has been the base for society and livelihood of the people. According to an estimate more than 60% of people are dependent on agriculture for their livelihood. The percentage of cultivable land is very high in India .This technique is to identify the infections in plants based on leaf, fruit and stem of the plant. In order to develop an automated technique to analyze the infections, a database is created. The database contains data related to plant leaf condition, minerals in the soil and the symptoms of disease to be affected .The plant details and the identification of disease from the feature variation are stored in the Cloud database. The entire database is viewed and compared on capturing the image. The mobile application is developed for accessing the data and providing intimation to the farmers. Thus the variation in image from the database and the test image indicates the disease in the plant.

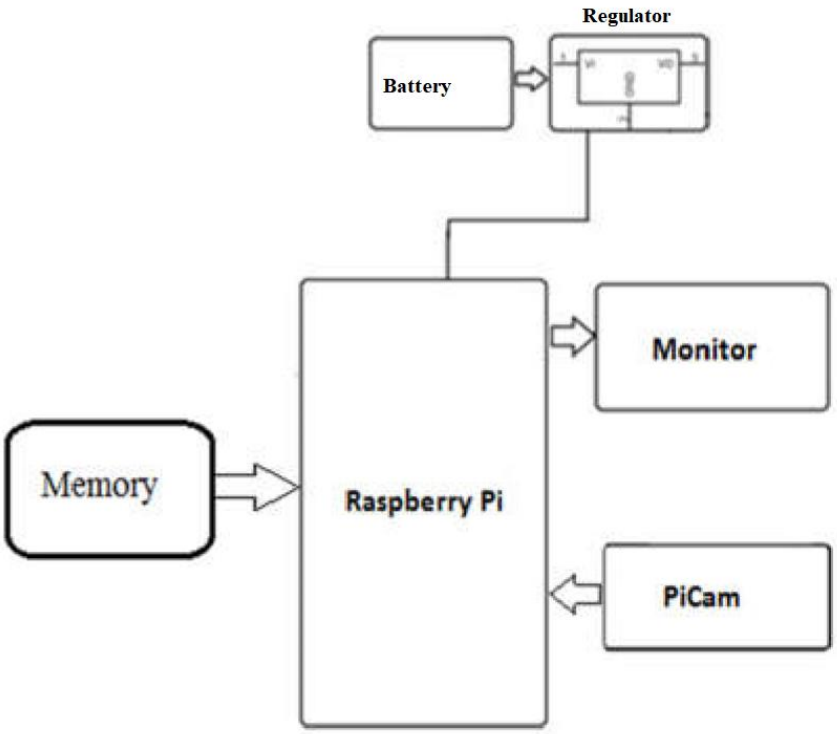

Figure 2.1: System Architecture

3. ALGORITHMS

1. CNN Algorithm

Convolution neural network algorithm is a multilayer perceptron that is the special design for identification of two-dimensional image information. Always has more layers: input layer, convolution layer, sample layer and output layer. CNN algorithm has two main processes: convolution and sampling.

Convolution Process: use a trainable filter F_X, de-convolution of the input image (the first stage is the input image, the input of the after convolution is the feature image of each layer, namely Feature Map), then add a bias b_X, we can get convolution layer C_X.
Sampling Process: n pixels of each neighborhood through pooling steps, become a pixel, and then by scalar weighting $W_X + 1$ weighted, add bias $b_X + 1$, and then by an activation function, produce a narrow n times feature map $S_X + 1$.

The key technology of CNN is the local receptive field, sharing of weights, sub sampling by time or space, so as to extract feature and reduce the size of the training parameters. The advantage of CNN algorithm is that to avoid the explicit feature extraction, and implicitly to learn from the training data; The same neuron weights on the surface of the feature mapping, thus network can learn parallels, reduce the complexity of the network; Adopting sub sampling structure by time or space, can achieve some degree of robustness, scale and deformation displacement; Input information and network topology can be a very good match, It has unique advantages in speech recognition and image processing.

$$O_{(x,y)}^{(l,k)} = \tanh \Sigma_{t=0}^{f-1} \Sigma_{r=0}^{k_n} \Sigma_{c=0}^{k_w} W_{(r,c)}^{(k,t)} O_{(x+r,x+c)}^{(l-1,t)} + Bias^{(l,k)}$$

among them, f is the number of convolution cores in a feature pattern. output of neuron of row x , column y in the
l^{th} sub sample layer and k^{th} feature pattern :

$$O_{(x,y)}^{(l,k)} = \tanh\left(W^k \Sigma_{r=0}^{s^n} \Sigma_{c=0}^{s^w} O_{(x\times s_n+r, y\times S_w+c)}^{(l-1,t)}\right) + Bias^{(l,k)}$$

the output of the j[th] neuron in 1[th] hide layer H :

$$O_{i,j} = \tanh\left(W^k \Sigma_{k=0}^{s-1} \Sigma_{x=0}^{s^n} \Sigma_{y=0}^{s^w} W_{(x,y)}^{(j,k)} O_{(x,y)}^{(l-1,k)}\right) + Bias^{(l,k)}$$

$$O_{(l,i)} = \tanh\left(\Sigma_{j=0}^{H} (\text{l-1, j})\, W_{(i,j)}^{l}\right) + Bias^{(l,j)}$$

2. K-Means Algorithm

Input : K- the number of clusters
D: a data set containing n objects
Output: A set of k clusters
Steps:
1) Randomly select k data objects from dataset D as initial cluster center.
2) Repeat.
3) Calculate the distance between each data object di (1 <= i<=n) and all k cluster centers cj(1<=j<=k) and assign data object di to the nearest cluster.
4) For each cluster j (1<=j<=k), recalculate the cluster center.
5) until no changing in the center of clusters.
The computational complexity of the algorithm is O(nkt)
n: the total number of objects
k: the number of clusters
t: the number of iterations

4. RESULTS

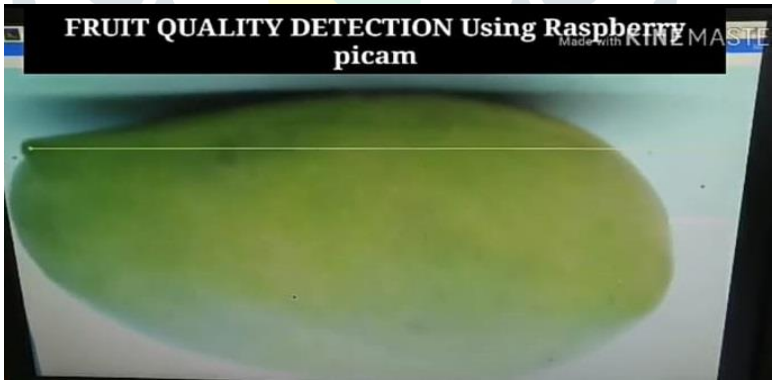

Fig. 4.1: Fruit Scan

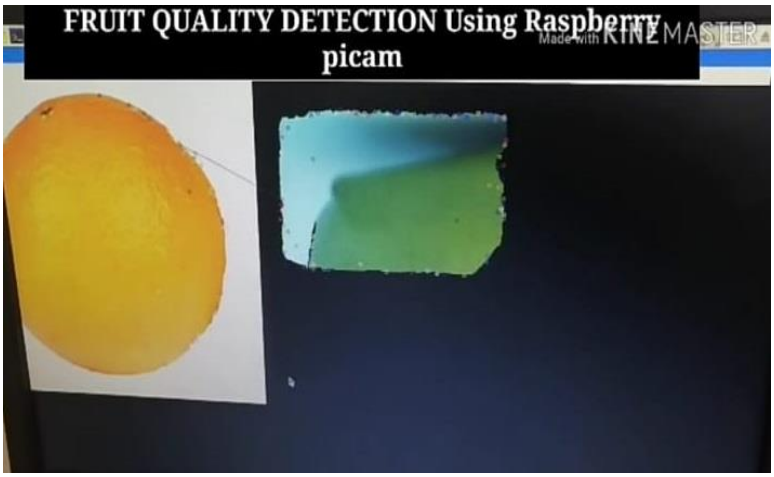

Fig. 4.2: Fruit Quality Check

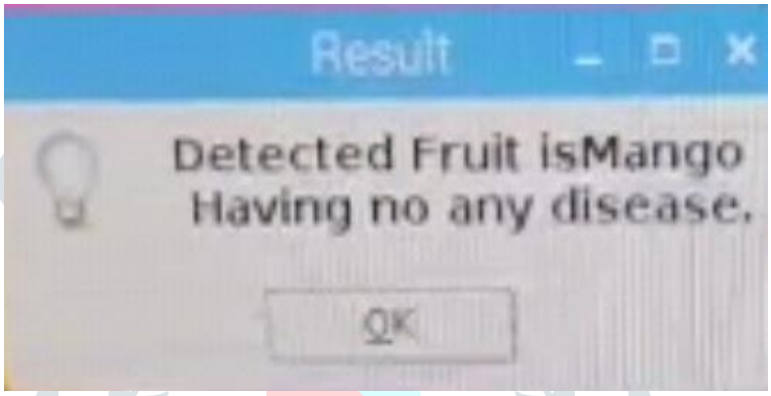

Fig 4.3: Display Resultant Fruit

5. APPLICATIONS

1. Can be use in real time fruit harvesting on the basis of quality of fruits
2. Can be use as different fruit disease detector.

6. CONCLUSION

In this work, we proposed a low-cost, Flexible system which will find out exact detailed quality of given fruit according to its natural condition. The classification and segmentation of fruit images were performed using K-Means Algorithm technique. The various features of the fruit were initially extracted and sent for segmentation of the respective images .After comparison with various disease names, the optimal disease for the image is analyzed, identified and the disease is indicated by an alert box .The total number of samples provided, the true and false positions, the true and false negativities, the accuracy and the specificity are also indicated in an alert box.

FUTURE SCOPE

In future scope we can add automatic fruit harvesting with robotic arm on basis of grading. Also Sorting of different fruits can be done on basis of damaged level, size and shapes of fruits.

REFERENCES

1) Chen, Xuming and Yang, Simon X. (2013), ”A Practical Solution for Ripe Tomato Recognition and Localisation”, Journal of Real-Time Image Process-ing, Vol. 8, No. I, pp. 35-51, January 2013.

2) Dang, Hongshe, Song, Jinguo and Guo, Qin (2010), ”A Fruit Size Detecting and Grading System Based on Image Processing,” 2010 Second International Conference on Intelligent Human-Machine Systems and Cybernetics, pp. 83-86.

3) Li, Changyong, Cao, Qixin and Guo, Feng (2009), ”A Method for Color Classification of Fruits Based on Machine Vision”, WTOS 8, Vol. 2, pp. 312-321, February, 2009.

4) Seng, Woo Chaw and Mirisaee, SeyedHadi (2009), ”A New Method for Fruits Recognition System”, Electrical Engineering and lriformatics, Vol. 01, pp. 130-134, August 2009.

5) Blasco1,Aleixos N. and Mollo E. ”Machine Vision System for Automatic Quality Grading of Fruit”, Biosystems Engineering, 2003. Vol. 85: pp. 415-423.

6) Leemans, V., Mageinb, H. and Destain, M.F. (2002), ”On-line Fruit Grading According to their External Quality using Machine Vision”, Journal of Automation and Emerging Technologies, Belgium. Biosystems Engineering, pp. 397-404, 2002

7) J. V. Frances, J. Calpe, E. Soria, M. Martinez, A. Rosado, A. J. Serrano, J. Calleja, M. Diaz, Application of ARMA modeling to the improvement of weight estimations in fruit sorting and grading machinery, IEEE 2000.

8) Nakano, Kazuhiro (1997), ”Application of Neural Networks to the Color Grad-ing of Apples”, Computers and Electronics in Agriculture, Elsevier, pp. 105-116, 1997.

9) Heron, J.R., and Zachariah, G.L. (1974), ”Automatic Sorting of Processing Tomatoes”. Transaction of the ISAE, Vol. 17, No, (5): pp. 987-992.