Analytical Review for Farmer Assist Bot

[1]Yashraj Mahajan, [2]Swami Nawale, [3]Utkarsha Pujari, [4]Sanchita Kanade

[1]Department of Information Technology, Sandip Institute of Technology and Research Center, Nashik, India,
[2]Department of Information Technology, Sandip Institute of Technology and Research Center, Nashik, India,
[3]Department of Information Technology, Sandip Institute of Technology and Research Center, Nashik, India,
[4]Department of Information Technology, Sandip Institute of Technology and Research Center, Nashik, India,
[1]Department of Information Technology,
[1]Sandip Institute of Technology and Research Center, Nashik, India.

Abstract: Smart Fruit Harvester is a robotic application developed for farmers to simplify the farming process. In fruit harvesting systems, automatic yield counting of fruits is a big issue. Thus, Image processing techniques used to minimize the manual task of counting and recognizing the fruits. So, in our proposed system a device will be set up on cable between the plant spaces in zigzag/row manner covering complete farm. The device comprises of a camera and a robotic arm for fruit cutting which will move through this cable working as Line Robot. It captures any defect in plant and notifies farmer. Raspberry Pi Zero W is the microcontroller used in the proposed system. IoT adds to it saving all data or changes made and making it remotely accessible.

Keywords—IoT (Internet of Things), Machine Learning, Image Processing, Smart Fruit Harvesting, Robotic Arm.

I. INTRODUCTION

Agriculture is the biggest sector in India but still farmers are doing hark work for small things instead of smart work. Farmers here waste a lot of time for counting fruits and yield production. Automatic counting of fruits in practical environment is the major issue in fruit harvesting system to increase the productivity with moderate cost. To automate this harvesting and yield counting process, different techniques are introduced using the IoT and Machine learning in farming application. The image processing applications were developed instead of manpower who failed to recognize and count the objects from the input images. It begins with fruit recognition with different colors, using RGB HEX format brings the hybrid method of combining the texture and color features. Unfortunately, farmers are still using traditional farming techniques that evolved hundreds of years ago. Due to this the yield of crops are becoming low and having a lot of quality and quantity issue. Smart fruit harvester consists of various electronic and mechanical components like sensors, camera modules, jumper wires, robotic arm, power supply etc. The present study proposes" Smart Fruit Harvester Robot" which can harvest without damaging the fruit and the tree to perform automatic fruit harvesting by a robot. We used a day and night vision cameras, Ultrasonic Sensors to detect the position of the fruit. We used object detection methods that use Convolution Neural Network (CNN). The Sensors and Cameras continuously check color and shape. A threedimensional position must be obtained to send a command to the robot arms. We used the harvesting robot arm as the end effector. The robot arm with a gripper to harvests a fruit by gripping and plucking it without damaging it and its tree.

II. LITERATURE SURVEY

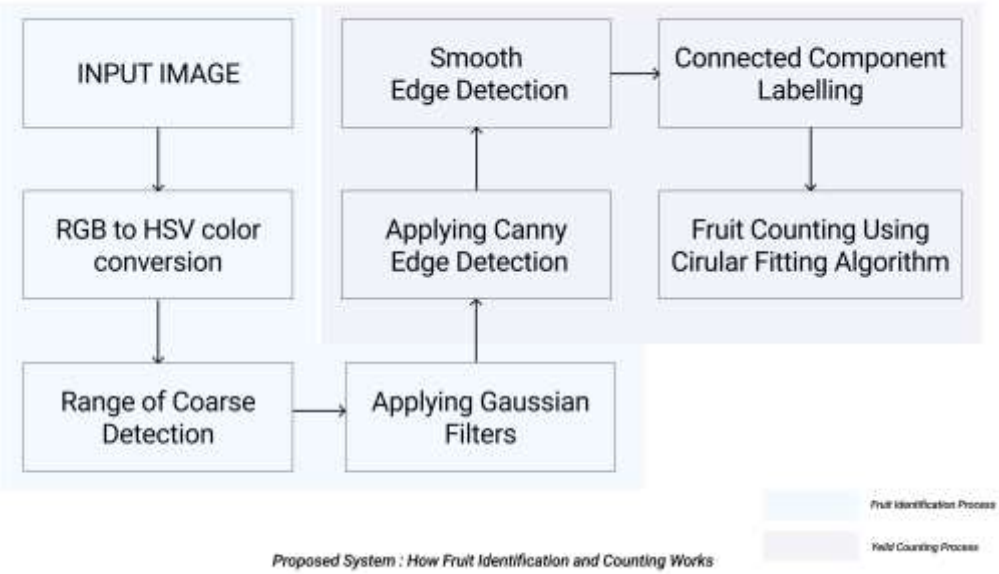
Automatic counting of fruits in practical environment is the major issue in crop management and fruit harvesting system to increase the productivity with moderate cost. There are various types of algorithms used for automatic segmentation and counting of objects in an image. [1] In this paper, there is a use of Image processing technique which helps to identify the fruits on that particular location. In Fruit harvesting system there are a lot of manual work required and counting of fruits become a big issue. Image processing techniques is use to minimize the task of counting and recognizing fruits manually. [2] In this paper we've found that author uses Color based detection techniques to identify the fruits. Those fruits having different color from the branches and leaves can be easily distinguished by color analysis. We found that not all the time we get wanted solution. Because sometimes fruits having greenish or brownish colors so it is difficult to distinguish from leaves/ branches using color analysis. [4] the plant leaves are grouped based on the colors in the leaves. Totally, three categories are specified to represent the leaf with greener, leaf with yellowish shades and leaf with reddish shades. [5] The studies of plant disease refer to the studies of visually observable patterns of a particular plant. Insecticides are not always proved efficient because insecticides may be harmful for some bird species. To identify the fruit, the method based on CNN is used [6] The image regions are extracted using selective search algorithm, then the regions have been selected by means of an entropy of fruit images, and finally these regions are regarded as input of CNN neural network for training and recognition. Taste-wise fruit sorting system using thermal image processing technique also used [7] This paper suggests a non-destructive technique which is based on thermal imaging that examines the internal and external properties of fruits. With the analysis of fruit surface's thermal properties, the ripening conditions can be recognized effectively. [8] the classification and segmentation of fruit images were performed using K-Means Algorithm and SVM technique. [9] In this paper, a portable optical instrument was designed and developed for real-time nondestructive determination of fruit ripeness. [10] In this paper, fractional order calculus and its capabilities in sense of image processing are analyzed for automatic fruit detection problem. Color analysis applied pomegranate and orange pictures. After color analysis edge detection is employed to segment fruits within the picture. For segmentation a fractional order calculus-based Sobel operator is employed. The performance of the system is evaluated with respect to the non-integer order. [11] In this paper, a technique by which a robotic arm is controlled using a depth sensor is proposed. The depth sensor captures the user input and inverse kinematics algorithm is used to define the motion of the robotic arm. [12] This paper proposes Real time Image Processing based Robotic Arm Control Standalone System using Raspberry pi. [13] A lightweight and easily controlled robotic arm with human interface is developed. The developed robotic arm is fully functional and accurately reacts to the movements from the use. [14] This paper presents a design of controlled robotic arm with myoelectric and body action signals. The effective remotely controlled robotic arms have been presented. The first design use the electrode patches to measure the electromyography (EMG) signal. [15] It gives a technical introduction to some of the recent research work in this field. The paper concludes with research gaps and proposed work. [16] This paper is based on IoT. IoT is a trending technology nowadays. Robotic arm is a copy of human arm which can do rotational motion and translation motion as human arm can do. [17] It is proposed to find how much percent the fruit

is affected and recognize the fruit in the given image. This feature is very useful for the farmers and useful for different purposes. [19] This paper introduced the concept of Circular Hough Transform and color thresholding, and it is applicable for detecting and counting all variety of apple irrespective of shape and size in normal day light with 97.7 percent accuracy. [20] This paper describes a color image processing based vision system for sorting of Fuji apples.

III. PROPOSED SYSTEM

A. Algorithm

Algorithm for Image Identification Algorithm we're using in this system is CNN also known as Convolutional Neural Network. In deep learning, a convolutional neural network (CNN or ConvNet) may be a class of deep neural networks, most ordinarily applied to analyzing visual imagery.



Proposed System : How Fruit Identification and Counting Works

REFERENCES

[1] T. Gayathri Devi, P. Neelamegam, S. Sudha , Image Processing System for Automatic Segmentation and Yield Prediction of Fruits using Open CV, 2018.
[2] Bengi Ozt ¨ urk, M ¨ urvet Kirci Ece Olcay G ¨ unes¸, ¨ Detection Of Green And Orange Color Fruits In Outdoor Conditions For Robotic Application ,2016.
[3] K. Lokesh Krishna, Omayo Silver, Wasswa Fahad Malende, K. Anuradha,Internet of Things Application for Implementation of Smart Agriculture System, 2017.
[4] P. Tamilselvi; K. Ashok Kumar, Unsupervised Machine Learning for Clustering the Infected Leaves based on the Leaf-colors, 2018.
[5] Shivkumar Bagde, Swaranjali Patil, Snehal Patil, P. Patil, Artificial Neural Network Based Plant Leaf Disease Detection, 2015.
[6] Lei Hou; QingXiang Wu; Qiyan Sun; Heng Yang; Pengfei L, Fruit Recognition Based On Convolution Neural Network, 2016.
[7] Suraj Raka; Ashutosh Kamat; Shubhada Chavan; Aanchal Tyagi; Pratik Soygaonkar, Taste-wise fruit sorting system using thermal image processing, 2019.
[8] R. Ramya; P. Kumar; K. Sivanandam; M. Babykala, Detection and Classification of Fruit Diseases Using Image Processing Cloud Computing,2020.
[9] Sadjad Abasi , Saeid Minaei , Bahareh Jamshidi , Davood Fathi, Development of an Optical Smart Portable Instrument for Fruit Quality Detection,2020.
[10] Bilgi Gorkem Yazgac¸ , M ¨ urvet Kırcı, ¨ Fractional order calculus based fruit detection, 2019.
[11] Rajesh Kannan Megalingam, Gedela Vamsy Vivek, Shiva Bandyopadahya, Robotic Arm Design, Development and Control for Agriculture Applications, 2016.
[12] Mrs.Hemalatha , C.K.Hemantha Lakshmi, Dr.S.A.K.Jilani , Real time Image Processing based Robotic Arm Control Standalone System using Raspberry pi, 2015.
[13] Jean Jiang, Alex McCoy, Eric Lee, and Li Tan, Development of a Motion Controlled Robotic Arm, 2017.
[14] Chien-Wei Chen, Rui-Ming Hong, Hung-Yu Wang, Design of a controlled robotic arm, 2016.
[15] Virendra Patidar, Ritu Tiwari, Survey of Robotic Arm and Parameters ,2016.
[16] Navin Agrawal, Vinay Singh, Vinay Parmar, Vijay Sharma, Dipti Singh, Design and Development of IoT based Robotic Arm by using Arduino, 2016.
[17] M.Nikhitha , S.Roopa Sri , B.Uma Maheswari, Fruit recognization and grade of disease detection using inception v3 model , 2019.
[18] S. R. Prathibha, Anupama Hongal, M. P. Jyothi, IOT Based Monitoring System in Smart Agriculture , 2017.
[19] Santi KUMARI Behera, Namrata Mishra, Prabira kumar Sethy, Amiya Rath On-Tree Detection and Counting of Apple Using Color Thresholding and CHT , 2018.