



MACHINE LEARNING BASED RIPEN FRUITS DETECTION ON TREES USING ADABOOST ALGORITHM

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Abstract— The proposed work aims at finding the fruits count from the acquired images of trees. Counting the fruits manually for yield estimation for farming and various managerial tasks is time consuming and it requires man power, which is not always cheap. We can segment the image accurately for the more accurate yield estimation. Even though different approaches are existing, the earlier method does not update the fruit count to the server for the estimation of daily yield, which results in the improving the productivity. The proposed work is mainly based on machine learning technique where several algorithms are used for counting the fruits and this idea is mainly focused on the farmers to help them in estimating the productivity based on the different climate environment.

Keywords— Matlab, Adaboost Classifier, PIC Development Board, ESP8266-12, SMPS Power supply

I. INTRODUCTION

Machine learning is an application of artificial intelligence (AI) that provides systems the

ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves. The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly. Machine learning gives analysis of high quantities of data. While it generally delivers faster, more accurate results in order to identify profitable opportunities or dangerous risks, it may also require additional time and resources to train it properly.

II. OBJECTIVE OF WORK

The main objective is to help the farmers to easily predict the yield estimation using this technology. The learning algorithm can also compare its output with the correct, intended

output and find errors in order to modify the model accordingly. . Our system also takes care of the cases where the fruit is occluded either by the leaves or by other fruit. We update the count of the fruits in the captured images to the server and display it in a computer. This helps the farmers to easily identify the ripen fruits. The RS232 driver on PIC development board allows easy connection with PC or other embedded hardware.

III. SYSTEM ANALYSIS EXISTING SYSTEM

The previous studies have developed numerous approaches to detect and count the fruits in an image. Most of them required thresholds for features such as color, shape and size. In addition, their performance strongly depended on the thresholds chosen, although optimal thresholds tended to vary with images. On the other hand, some researchers have used hyper spectral thermal and ultrasonic imaging technologies for fruit detection. However, these technologies require expensive instruments compared with RGB cameras, and thus are not suitable for practical use.

DISADVANTAGE OF EXISTING SYSTEM

- The number of clusters has to be determined by users.
- The researchers did not discuss the advantages of using a 3D point cloud.
- That young fruits are very difficult to detect as their color is similar to that of the stem class and their size is quite small.

BLOCK DIAGRAM:

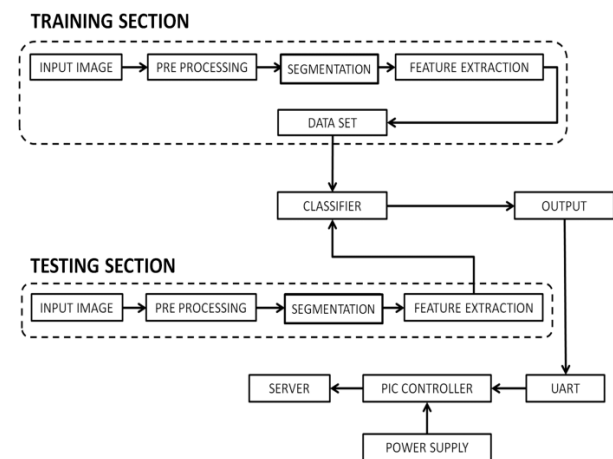


Fig. Block Diagram of Proposed system

PROPOSED SYSTEM

In this project, we aimed to develop a method to accurately detect individual intact fruits including mature, immature and young fruits on plant using a conventional digital camera in conjunction with machine learning approaches, which have been being utilized in a wide range of biological studies.

- The developed method was based on an image segmentation process involving three steps: pixel-based segmentation, blob-based segmentation and individual fruit detection.
- For each step, classification models were generated using the color, shape, texture and size of the images.

- The image segmentations were conducted using the generated models; therefore, the developed method does not require that threshold values be adjusted to each image.
- Finally, we evaluated the fruit detection to identify the effectiveness of the developed method for yield estimation of intact fruits.

ADVANTAGES OF PROPOSED SYSTEM

- Color information and distance to an object can be simultaneously measured using consumer depth cameras.
- The distance to an object is measured, the relative size of the object in the image can be determined.
- The fruits were detected with high accuracy.

IV.SYSTEM DESIGN

PIC DEVELOPMENT BOARD

The PIC development board is used to prototype with any of Microchip's 40 pin PIC microcontrollers. The RS232 driver on board allows easy connection with PC or other embedded hardware. The board have User button and status LED. The bridge rectifier allow this board to be powered with both AC and DC power supply adapters. PIC-P40 supports both 3V low power and normal 5V operation.

ESP8266 -12 WITH BREAKOUT BOARD

This is breakout board for the very popular ESP8266 ESP-12 WiFi module. Now, it is even easier to connect to the ESP-12 and start using it stand-alone. This board has all the pins broken out to the standard , so it is compatible with berg headers, breadboards and dot matrix board. It has a

3.3 V AMS Voltage regulator on board, which means you can plug in your 5V supply directly and start working with the board. For those of you who are new to the IoT space, ESP8266 ESP-12 is a highly integrated chip designed for the needs of a new connected world. It offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor. ESP8266 ESP-12 has powerful on-board processing and storage capabilities that allow it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

SMPS POWER SUPPLY

Switch Mode Power Supply (SMPS) is an electronic device which is used to provide uninterrupted electronic power. This switch mode power supply (SMPS) is known for its low power dissipation and easy installation. It is checked under various set quality parameters. Furthermore, it is integrated with switching regulator which is used for ideally converting electrical power. Switch mode power supplies are an extraordinary array of high frequency alternative. These are the switching regulators that offer higher efficiency than the linear regulators. In addition they can step-up, step-down and invert the input voltage.

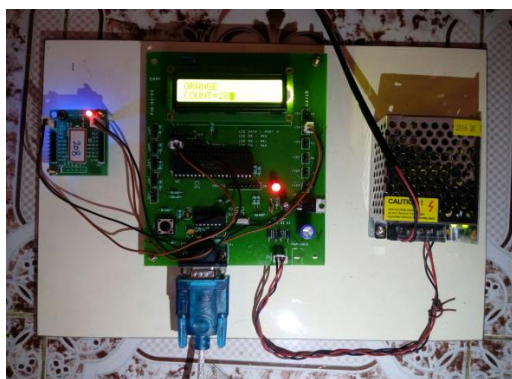


Fig. Snapshot of the completed proposed work

The hardware parts used here are PIC16f877a microcontroller, SMPS power supply and esp8266 for transmitting data to the server. The exact count of the ripen fruits of different trees are displayed in the LCD and uploaded the count to the server. The data in the server are being analyzed by Machine Learning techniques which can be used to predict the future yield

FRUIT TYPE	COUNT	Date
ORANGE	28	2018-04-03 01:19:20
PAPAYA	1	2018-04-03 01:15:55
FIG	3	2018-04-03 01:15:32

Fig: Fruits count displayed in webpage

VI. CONCLUSION

This paper proposes an image-processing method to accurately detect individual intact tomato fruits, including mature, immature and

young fruits, on plant using a conventional RGB digital camera in conjunction with machine learning approaches. The proposed method consists of three steps. At the first step, pixel-based segmentation was conducted to roughly segment the pixels of the images into classes composed of fruits, leaves, stems and backgrounds. Blob-based segmentation was then conducted to eliminate misclassifications generated at the first step. At the third step, X-means clustering was applied to detect individual fruits in a fruit cluster. The developed method did not require an adjustment of the threshold values of each image for fruit detection because the image segmentations were conducted based on classification models generated by machine learning approaches. The results of fruit detection in the test images showed that the developed method achieved a recall of 0.80, while the precision was 0.88. In addition, the recall of young fruits was 0.78, although detection of young fruits is very difficult because of their small size and the similarity of their appearances with that of stems.

VIII. FUTURE WORK

Future work includes a drone for the real time measurement of the fruits on the trees. By using drone we can easily count the ripen fruits in a tree. The technology is developing day by day. So it can easily carried out.

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X. REFERENCES

1. Aggelopoulou, A.D.; Bochtis, D.; Fountas, S.; Swain, K.C.; Gemtos, T.A.;

- Nanos, G.D. Yield prediction in apple orchards based on image processing. *Precis. Agric.* 2011, 12, 448–456.
2. Arnaud A. A. Setio, Francesco Ciompi, Geert Litjens, Paul Gerke; A Machine Vision Algorithm Combining Adaptive Segmentation And Shape Analysis For Orange Fruit Detection, *IEEE Transactions on Imaging* (Volume: 35, Issue: 5, May 2016)
3. Hočevár, M.; Širok, B.; Godeša, T.; Stopar, M. Flowering estimation in apple orchards by image analysis. *Precis. Agric.* 2013, 14, 1–13.
4. Kurtulmus, F.; Lee, W.S.; Vardar, A. Immature peach detection in colour images acquired in natural illumination conditions using statistical classifiers and neural network. *Precis. Agric.* 2013.
5. Linker, R.; Cohen, O.; Naor, A. Determination of the number of green apples in RGB images recorded in orchards. *Comput. Electron. Agric.* 2012, 81, 45–57.
6. Shreya Lal; Santi Kumari Behera; Prabira Kumar Sethy; Identification And Counting Of Mature Apple Fruit Based On Bp Feed Forward Neural Network, 2017 Third International Conference on Sensing, Signal Processing and Security
7. Steven W. Chen, Shreyas S. Shivakumar, Sandeep Dcunha; Counting Apples And Oranges With Deep Learning: A Data Driven Approach, *IEEE Robotics and Automation Letters* (Volume: 2, Issue: 2, April 2017)
8. Yamamoto K; Guo W; Yoshioka Y; Ninomiya S; On Plant Detection Of Intact Tomato Fruits Using Image Analysis And Machine Learning Methods, *Sensors* (Basel). 2014 Jul 9; 14(7):12191-206. DOI: 10.3390/s140712191.
9. Wang, Q.; Nuske, S.; Bergerman, M.; Singh, S. Automated Crop Yield Estimation for Apple Orchards. In *Proceedings of the 13th International Symposium on Experimental Robotics (ISER 2012)*, Quebec, QC, Canada, 18–21 June 2012; pp. 745–758.

