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Mango detection in orchards using YOLO model

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Abstract: fruit detection is helpful in agriculture field for reducing manual work. It can be aslo increase the speed of harvesting and helpful to lower the production cost on tree detection of mango is challenging because of fluctuating illumination , overlapping mango and branches of tree .we proposed tiny YOLO model for the automatic detection of on tree mango .initially we collect the on tree mangoes images for creating data set. Then this images are augmented and divide this data in two part for training and testing

Keywords*:- *fruit detection, you only look once (YOLO), machine learning

I. INTRODUCTION

By using machine learning technology we can develop a system which can be helpful for the agricultural field. we can use this technology for automatic detection of fruit, weed, crop. the should be able to detect correctly .to achieve human level accuracy is challenging task. because of fluctuating illumination, color of leaf and fruit, overlapping of fruit cannot be identified correctly .with accurate knowledge of location of fruit yield estimation can be increase .Precise localization of the fruit is also a necessary component of an automated harvesting system, which can help mitigate one of the most labor-intensive tasks in an orchard. image information can be used to accurately judge crop growth and estimate crop yield. technology can also helpful for continuous monitoring of growth of crop.

Various parameter can affect the automatic detection of fruit such as background, overlapping fruit, branches and leaves,

Environmental condition, lightning condition and other factor in orchads .

II. LITERATURE REVIEW

The paper [1] discussed the real-time detection of apple in orchards during the various stage. This paper describes an improved version of YOLO V3 model. This compares the Capabilities of both model and conclude that YOLO V3 dense model is superior to the YOLO V3 model & faster RNN.

The paper [2] states a comparative study of various YOLO versions. It represents the updates in YOLO. It gives the brief idea of YOLO V3 version. This state that YOLO V3 is good detector, fast and accurate compared to the other versions of YOLO

The paper [3] states the comparative analysis of different color spaces for orange fruit like RGB, HSV, L*a*b & YIQ .In this, by using vision algorithms ripe fruit was recognized from other images.

The paper [4] makes the necessity of fruit identification and classification using image processing. It states the comparative study of edge and color based detection and their performance. It used Open CV for the computer vision.

The paper [5] propose the mechanism for identification and classification to handle the bulk of data. It also gives the two-class as output based on their quality. MATLAB had been used as the programming tool for identification and classification.

III. PROPOSED SYSTEM

In this approach, methods have been presented to detect the fruits from a tree in the environmental condition by using a neural network.

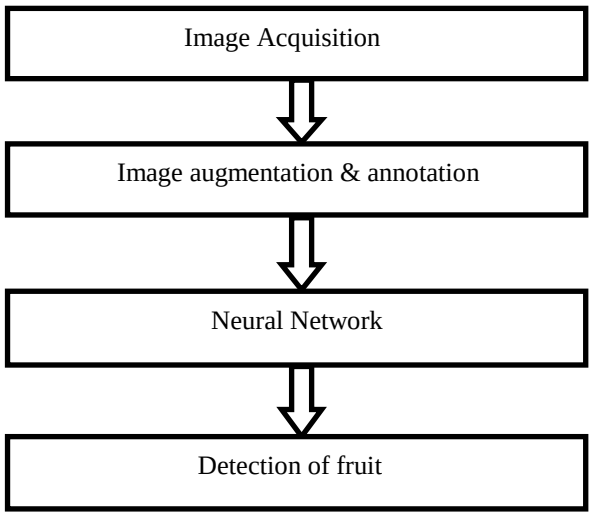

Fig.1. Basic Workflow of the fruit propose system

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A. *Image Database*

The database was generated by collecting images from ACFR Orchard Fruit Dataset, Contains 1964 images of Mangos on tree.

B. *Pre-processing*

- *Image data augmentation :*

Mangoes in orchards were detected and the stages of mango were judged. Since the angle and intensity of sunlight illumination vary greatly during the day, whether the neural network can process the images collected at the different time of the day depends on the integrity of the training dataset. In order to enhance the richness of the experimental dataset, the collected images were pre-processed in terms of color, brightness, rotation, and image definition, and the dataset was augmented.

- *Images annotation and dataset production*

The lengths of the training set images were rescaled to 500 pixels and the widths were adjusted accordingly to maintain the original aspect ratio while creating the training set. Manual annotation was applied after the images were numbered. Bounding boxes were drawn and the categories were classified manually. Positive samples with insufficient or unclear pixel area were not labeled to prevent over-fitting in the neural network.

IV. METHODOLOGY

In order to detect mango images, we followed a specific methodology. Initially, the image of the mango was augmented, and the annotation is applied for creations of the dataset. Finally, Yolo algorithm is going to use to determine whether the Mango is present or not a prediction of its location in the image**.**

A. *NEURAL NETWORK*

The neural network basically consists of an input layer, one or many hidden layers, and output layer. It may have one or many input layer as per requirement each hidden layer have different no of the neuron.

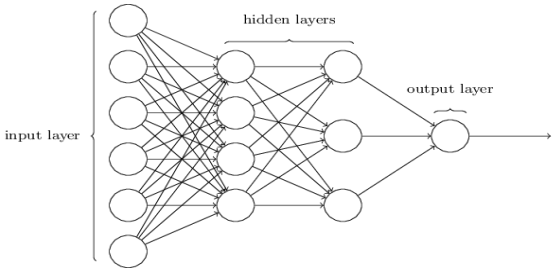

Fig.2.Neural Network Structure

B. *YOLO (YOU ONLY LOOK ONCE)*

The YOLO (You Only Look Once) is evolved from CNN. Compared with the Faster R-CNN network, the YOLO network transforms the detection problem into a regression problem. It does not require a proposal region, and it generates bounding box coordinates and probabilities of each class directly through regression .This greatly increases the detection speed compared to Faster R-CNN. The YOLO detection model is shown in Fig. 5. The network divides each image in the training set into S× S (S= 13) grids. If the center of the target ground truth falls in a grid, then the grid is responsible for detecting the target. Each grid predicts B bounding boxes and their confidence scores, as well as C class conditional probabilities.

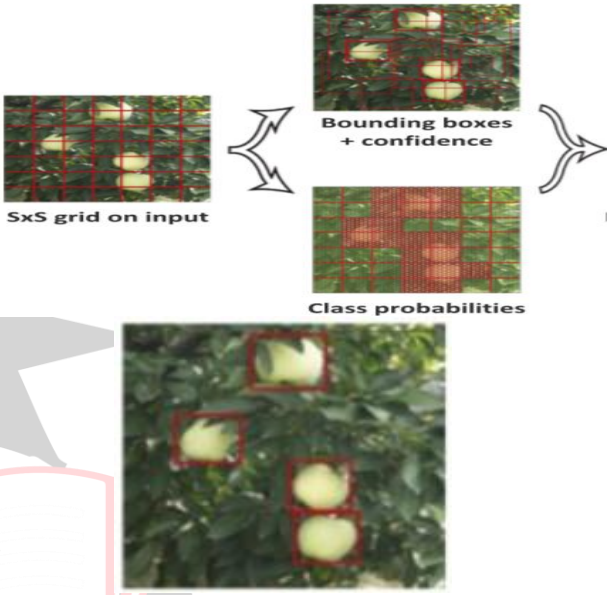

Fig.3. You only look once

The You Only Look Once (YOLO) method [1] unites target classification and localization into a regression problem. A YOLO network does not require RPN, and it directly performs regression to detect targets in the image. The network provides much faster detection. The state-of-art version (YOLO-V3) not only has high detection accuracy and speed but also performs well with detecting small targets. However, the YOLO-V3 model has not been widely used for fruit detection.

Feature maps are gradually shrinking due to the use of convolution and down-sampling operations in deep neural networks. The Dense Net architecture is proposed for using the input features of neural networks more efficiently.

V. IMPLEMENTATION

The proposed system is implemented using the open-source computer vision (Open CV). Open CV is written in C language but now available in C++ interface and python. Open CV runs on most of the Operating system including Linux, Windows, etc.

Python libraries help people to the used an optimized algorithm. It is useful to implement various machine learning technique like classification, clustering, regression, etc. It supports various programming scripts and syntax

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which allow programming in most of the language like C++ or Java.

Scikit–learn this open sources python library basically used to build a model, it provides many supervised and unsupervised algorithms. It is built on Numpy, Scipy, and Matplotlib. It is simple tool for data mining and data analysis. Matplotlib is used to show results in the form of graph and plots.

VI. RESULTS

The performance of the proposed system is evaluated on ACFR Orchard Fruit Dataset. The results of the proposed approach are presented in terms of a qualitative and quantitative manner

Fig.4 Qualitative analysis of the proposed mango identification system

VII. CONCLUSION

Considering the advantages of CNN to recognized the multiple images from the scene, this approach is modified to the detection of on tree mangoes using the benefits of the trained model by transfer learning. This approach is implemented by retraining final layer of the Yolo model for the mangoes detection task. The system is implemented

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