An Intelligent Fruit Counting System

Bhushan P. Ragit, Arti V. Bhingare, Rushikesh T. Bankar

Abstract - In this paper image processing based yield counting system and health monitoring of citrus fruit is being processed. The model which is explained in the paper can be worked in any graphical area. The system consists of an automatic robot which revolves around. The axis of citrus tree and clicks various images from different angle. Then this images are processed by image processing algorithm and color based counting of fruit is presented at the output. The system is being designed to automatically and accurately calculated the yield of citrus group tree and health monitoring is temperature and moisture of tree is also include in system.

Keyword: Digital Signal Processing, Signal Processing, Data Equalization, Embedded Technology, Image Processing, Robotics, WSN.

I. INTRODUCTION

In India vidhar bha specially Nagpur citrus group fruits such as orange, lemon, sweet lime. grower farmers are in large numbers. About 75% farming totally depends on orange and sweet lime. But one thing is noticeable the yield calculation of the fruit tree is manual even after so many advancement in other sectors to solve this problem there was necessity of such user friendly system.

So we had development such a system which automatically calculate the tiled of citrus fruit tree. Many researchers had worked in this area and got different results. The combination of color and texture is proposed by author in [2] for fruit recognition. The author for [1] proposed as system whose analysis and fruit recognition depends on shapes in the image it also talks are about the maturity of stage of fruit. A computer vision system capable of detecting defects in the citrus peel was presented in [3]. The author in [4] used the local or shapes based analysis for rapid fruit segmentation and were able to detect the fruit at specific maturity stages i.e., fruit with a color different from the background. The on-line estimation of oranges, peaches and apples regarding the quality attributes like size, color, stem location and segmentation of external blemishes was presented in [5].

Based on Bayesian discriminate analysis, the effect of drying on shrinkage, color and image texture of apple discs was presented in [6]. Apple discs were classified into classes depending on external image features at different stages of drying by Euclidean distance classifier. A machine vision algorithm consists of segmentation, region labeling, size filtering, perimeter extraction and perimeter-based segmentation, for the recognition of orange fruit was presented in [7].

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The authors in [8] had developed three types of harvesting robot: strawberry-harvesting robot, eggplant-harvesting robot and tomato-harvesting robot. The survey of different vision based algorithm is presented in [9]. An automatic fruit recognition system and a review of various fruit detection work are reported by the authors in [10]. The defects of the citrus peel are segmented by sobel gradient and the flaw is extracted using euler distance, nearest neighbor and k-nearest neighbor classifiers by the authors in [12].

Multiple features were used for the detection of various fruits from the sectional tree images. For the accurate detection of different color fruits, the authors in [13] had used color, intensity, edge and orientation feature vectors of the input image. For gray-scale MR medical and aerial images, a new segmentation method based on gray-scale morphology was proposed in [14].The models for illumination and surface reflectance for use in outdoor color vision, and in particular for predicting the color of surfaces under outdoor conditions was discussed in [15]. Fruit recognition system using color, shape and size based feature analysis with 90% of recognition accuracy achieved by authors in[16]. Color and texture features were used to locate green and red apples by authors in [17].

In our system a camera which provided the required images of tree is consider as primary sensing element. The system consists of primary sensing elements that are camera system or client robot. a communication protocol logic control and motors switching circuits The camera is used to clicks the different images of the tree serial or UART communication protocol is used to develop communication between pc and different sensors in the system logic control circuits one used control circuits soil sensors.

II. BLOCK DIAGRAM

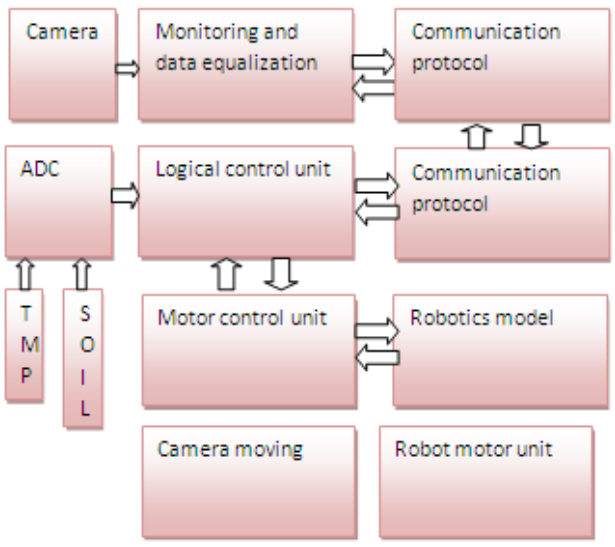

Figure 1: Block Diagram of the proposed system.

III. WORKING

A. Yield calculation

In this paper we had made use of her cascade algorithm for colour base segmentation of the image for this camera is fixed on autonomous robot which click image. Firstly the robot calculates the radius of trees and revolves around the axis the camera click image with the angular displacement the robot moves 30^0 and click image so the camera click total 2 image.then this image are moved via UART TO THE SYSTEM FOR IMAGE firstly processing the system is being trainel on RGB and HSU parameter and a range of different value.this is decided as a threshold value. This is because the colour of fruit changes for different stage of mainly when the clicked image is processed for comparison the object in the image which matches with the range of decided parameter is being canceled and thus the fruit is being counted. In this process hoer cascade algorithm plays a vital role some time the fruit in the image appears such as one fruit but it consist two fruit one behind other so to detect such object depth factor is taken into consideration.

B. Health monitoring

Health monitoring is an important feature of the system.unless the health of plant will be good the yield of tree will be more.so we proposed a additional feature of health monitor ie. Soil moisture detector the sensor are being connected to logic control ckt via ADC. When the system wants to check the moisture of soil two probes electrically seprated are used this probes are penetrated in the soil and voltage is passed. If the moisture level of soil is high them the voltage flow from one probe to another is established. So depending on the amount of voltage in returned moisture level soil is determined.

C. Autonomous Robot

The robot used in the system is a simple robot consisting of two left and right motors controlling the wheels of robot. So, to move amount the axis of trees the motor switching circuit ONs the motor in following combination.

For first 10ms=A & B ON
For next 10ms=A is ON
For next 10ms=A & B ON
& continued
It also moves camera connected high to reach height of tree.

D. Stand Alone System Control Unit

A front end with buttons on it is developed using VB.Net to make system work on click.

IV. SERIAL COMMUNICATION

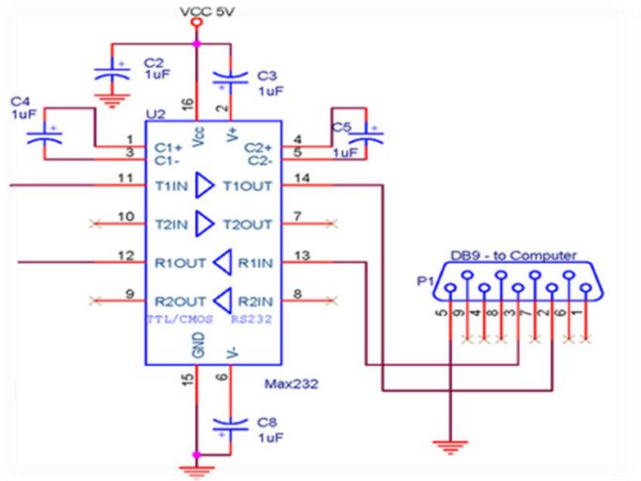

Figure 2: Serial Communication in the proposed system.

Serial communication is one of easiest communication protocol available. This example demonstrates how to use serial communication to send and receive data through serial port (rs232c) available in computer**.**

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