Embedded System for Automatic Real Time Weight Based Grading Of Fruits

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Abstract— *Separation of fruits is performed primarily by visual inspection using size as a especial quality attribute. Many industries with capability of large-scale buying and selling of fruits & vegetables, are using image processing technology for sorting motive. But the image processing system of sorting requires very highly developed technology of image capturing and processing which is very costly and not right for small traders. The proposed sorting system in this paper offers an economical solution for such grade of automated fruit sorting practices. By dealing with an automated material handling system, it reasons in dividing the fruits by weight which is coming on the conveyor, by moving the fruits near its respective packing place. There by the prosy work done by human is eliminated, acquiring accuracy and speed in the work. Weight of fruit is used as a design metric to sort the fruits in food processing. And for sorting using weight as a parameter the load cell plan is ideal. This sorting method presents a precise, safe, consistent and quantitative sorting technique for fruit sorting based on weight of the fruits. Automated sorting system not only speeds up the time of the process but also decrease fault.*

Keywords: Fruit, Load cell,

I. INTRODUCTION

The aim is to design a fruit separation machine which is portable. For this, the main task is to integrate ATMEGA 328 microcontroller as a main control system with intact electro-pneumatic system and is used to control the sequence of operations performed by the system. This project consists of slope and slider assembly and electronics component. The electronics part consists of PCB designing and mounting of various electronics components with the micro Fruit quality management system based   on load cell provides a fully automated system designed to combine processes such as feature extraction   and sorting according to weight. Weight of fruit is used as a design metric in food processing and for sorting using weight as a parameter the load cell plan is used. Embedded system has the advantage of high accuracy of sorting, high speed and low cost. This proposed system will have a good prospect of application in fruit quality detecting and sorting areas. Performs the sorting and property check using ARDUINO software.
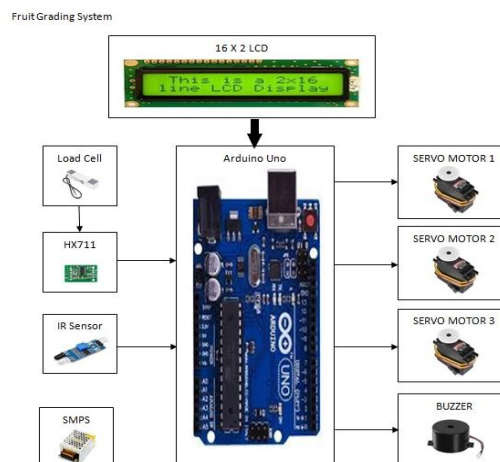
II. BLOCK DAIGRAM

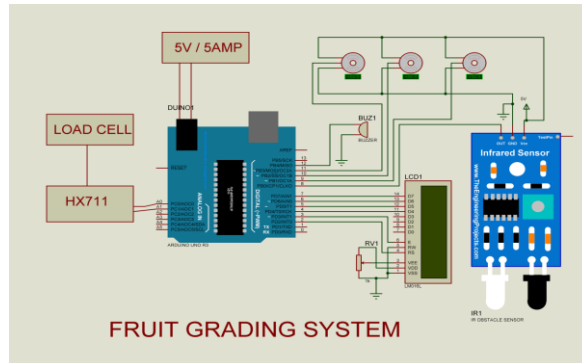Fig. Block Diagram of Project

III.CIRCUIT DIAGRAM

Fig. Circuit Diagram of Project

IV.BRIEF OPERATION

In our system, we have to place the fruit on load cell mechanism. The IR sensor will detect the fruit and buzzer will turn ON. After that the weight of fruit is automatically measured and signals are given to servo motors. The first servo motor is used to push the fruit from load cell to separation mechanism. If the fruit weight is upto 100gm then second motor get the signal to sort this fruit. And if the fruit weight is in between 100gm to 200gm, then third motor get the signal to sort this fruit in another try. And if the fruit weight is above 200gm then no motor gets the signal. So the fruit will not be blocked. And that fruit will go straight.

V. COMPONENT DESCRIPTION

*5.1. Arduino Uno***:**

Arduino Uno is a very priceless addition in the electronics that comprises of USB interface, 14 digital I/O pins, 6 analog pins, and Atmega328 microcontroller. It also supports serial communication using Transmitter and Receiver pins. There are more versions of Arduino boards introduced in the market like Arduino Uno, Arduino Due, Arduino Leonardo, Arduino Mega, howsoever, most common versions are Arduino Uno and Arduino Mega. If you are planning to bring a plan relating to digital electronics, embedded system, robotics, or IOT, afterwards using Arduino Uno would be the pre-eminent, easy and most economical option. It is an open-source platform, means the boards and software are by chance procurable and anybody can innovate and optimize the boards for better functionality. The software used for Arduino devices is called IDE (Integrated Development Environment) which is open to use and required some main art to learn it. It can be programmed using C and C++ nomenclature.

5.2. Load cell with HX711 weighing sensor module:

Load cell is transducer which converts force or pressure into electrical output. Magnitude of this electrical output is directly proportional to the force being applied. Load cells comprises strain gauge, which deforms when pressure is applied on it. And then strain gauge creates electrical signal on deformation as its effective resistance changes on deformation. A load cell usually consists of four strain gauges in a Wheatstone bridge form. Load cell comes in sundry ranges like 5kg, 10kg, 100kg and many, here we have used Load cell, which can weight up-to 40kg.Now the electrical signals created by Load cell is in exiguous milli-volts, so they require to be additional expound by some amplifier and hence HX711 Weighing Sensor comes into image. HX711 Weighing Sensor Module has HX711 impeller, which is a 24 high precision Analog to digital converter. HX711 has two analog input channels and we can get obtain up to128 by programming these channels. So HX711 module expands the subordinate

electric output of Load cells and then this amplified & digitally converted signal is fed into the Arduino to achieve the weight. Load cell is interfaced with HX711 Load cell Amplifier using four wires. These four wires are Red, Black, White and Green/Blue. There may be slight contrast in colours of wires from module to module. Beneath the connection details and diagram:

RED Wire is connected to E+

BLACK Wire is connected to E-

WHITE Wire is connected to A-

GREEN Wire is connected to A+

5.3. IR Sensor:

IR Infrared barrier prevention Sensor Module has a couple of infrared transmission and reception tubes. When the emerging light waves are reflected back, the reflected IR waves will be received by the receiver tube. The onboard comparator assembly does the processing and the green indicator LED comes to life.

The module features a 3 wire connected with Vcc, GND and an OUTPUT pin on its tail. It works fine with 3v3 to 5V levels. Upon hindrance, the output pin gives out a digital signal (a low-level signal). The onboard preset helps to virgate tune the range of operation, effective distance range is 2cm to 80cm.

5.4. Servo Motor:

Servo motors have been around for a far time and are utilized in more applications. They are small in measure but pack a big punch and are very energy-efficient. These features allow them to be used to conduct remote-controlled or radio-controlled toy cars, robots and airplanes. Servo motors are also useful for industrial applications, robotics, in-line manufacturing, pharmaceutics and food services.

The servo circuitry is built right inside the motor unit and has a positionable shaft, which usually is fitted with a gear. The motor is controlled with an electric signal which determines the amount of locomotion of the shaft.

5.5. Buzzer:

Piezo buzzer is an electronic device broadly used to induce sound. Light weight, simple construction and low price make it usable in various applications like truck reversing indicator, computers, call bells etc. Piezo buzzer is based on the inverse principles of piezo electricity discovered in 1880 by Jacques and Pierre Curie. It is the perceptible of generating electricity when mechanical pressure is applied to certain materials and the vice versa is also true. Such materials are called piezo electric materials. Piezo electric materials are either naturally procurable or manmade. Piezoceramic is class of manmade material, which poses piezo electric effect and is widely used to make disc, the heart of piezo buzzer. When related to an alternating electric field they tense or compress, in accordance with the frequency of the signal thereby producing sound.

5.6. SMPS:

In our system we require 5 V 5 Amp SMPS. Servo Motor requires 2 amp current. At a time 2 servo motors will operate so we require minimum 4 amp SMPS.

IV. FUTURE SCOPE

Most of times when fruits arrives from the plantation to their processing units, they are found in tainted condition. They need to be washed first before processing. In this proposed system we can add an arrangement which will wash the fruits before gets sorted. In augmenation to this design which sorts fruits on the basis of weight, we can also develop a structure in it which will sort the fruits on the basis of its size as well before sorting it on the basis of weight. This will increase the precision of sorting and hence the overall efficiency of whole sorter.

V. CONCLUSIONS

The work in this project has resulted in a system having definite and systematic sequence of operations which are performed pleasingly in order to obtain the end result. It is testified that use of machine is an alternative for unreliable manual sorting. The overall system comprises of mechanical and electronics sector.

VI. ACKNOWLEDMENT

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