A Fruit Checking System using Microcontroller: A Review

Radhika Balu Bhansali[1] Prof. Veerbhadra Bale[2]
[1]ME Student [2]Associate Professor
[1,2]Department of Electronics Engineering
[1,2]M. S. Bidve Engineering College, Latur Dist. Latur, Maharashtra, India

Abstract— A non-destructive fruit quality checking method is becoming an important issue now a days. The quality of fruits can directly affect the human beings so fruit quality checking methods having value at great extent. Quality of fruits determination based on its weight, height and its surface colour. In this method, IR sensor detects the fruit which is mounted on the conveyor belt. After detecting the fruit, the image of fruit is captured which is in the RGB colour model .when the fruit falls on the load cell, the load cell unit measures the weight of a fruit. ADC then digitizes this value in hex format. The microcontroller then displays the weight of a fruit on a LCD. MATLAB software is used to analyze the shape and size of a fruit. This paper covers the basic subsystems used in quality checking of fruits. This paper may help to one who want to know about the fruit quality checking method.

Key words: RGB, ADC, LCD, MATLAB

I. INTRODUCTION

In the globalized world, market demands increasing rapidly. The quality checking and testing is playing a vital role in all areas. In food exports, quality checking is an important issue. Both the developed and developing countries are focusing on Quality checking methods. In developing countries agriculture is the mainstay of the economy. As such, it should be no surprise that agricultural industries and related activities can account for a considerable proportion of their output. Of the various types of activities that can be termed as agriculturally based, fruit and vegetable processing and quality check are among the most important. Both established and planned fruit and vegetable processing projects aim at solving a very clearly identified quality check problem. As it is nondestructive testing method, this testing method does not damage the product or good which is under testing. Fruits or vegetables gets affected by atmospheric conditions, continue monitoring or testing is a key factor in food processing area. Even established fruit and vegetable canning factories or small/medium scale processing centers suffer huge loss due to erratic supplies. The grower may like to sell his produce in the open market directly to the consumer, or the produce may not be of high enough quality to process even though it might be good enough for the table. This means that processing capacities will be seriously underexploited. The main objective of fruit and vegetable quality check is to supply wholesome, safe, nutritious and acceptable food to consumers. This paper will give idea about the procedure for quality checking of fruits or vegetables.

II. STRUCTURAL DIAGRAM & WORKING

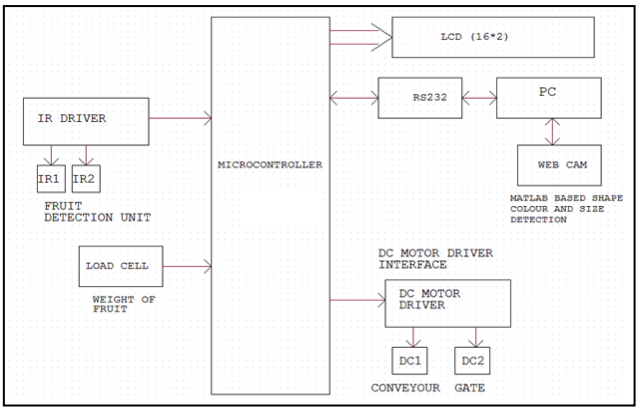

Fig. 1.1: Structural Diagram

A. IR Sensor Unit

The two IR based sensors, one is for detecting the fruit on the conveyor belt and the other is to detect the presence of fruit in front of the camera. After the first IR sensor gives the high to low pulse that is the fruit is detected on the conveyor belt, the belt starts to move in the forward direction. Next, the second IR sensor gives a low to high pulse when the fruit has reached in front of the camera. After this pulse is detected the µC then stops the conveyor and gives an indication to PC via RS232.Image of respective fruit has been captured.

B. Load Cell Unit

The load cell is used to log the weight of fruit. As soon as the fruit falls on the load cell the load cell with the help of signaling circuit will give the corresponding analog voltage to the Analog to Digital converter (ADC).The ADC then digitizes the analog value in HEX format. After this the HEX data is given to µC. The µC then displays the weight of the fruit on LCD.

C. LCD Display Unit

A 16 character by 2 line display is used for display purpose. The main objective to use LCD is to display the various parameters of the project, Such as Weight of the fruit.

D. PC Unit

The MATLAB is used to mathematically analyze the shape and size of the fruit.

E. DC Motor Unit

12v DC motor is used to drive the DC motor based conveyor. The µC cannot provide the current required by the DC motor, so by interfacing a DC motor driver L293D, Which is used to drive the 12V DC Motor.

F. ARM7 LPC2138

The LPC2131/32/34/36/38 microcontrollers are based on a 16/32-bit ARM7TDMI-S CPU with real-time emulation and

embedded trace support, that combine the microcontroller with 32 kB, 64 kB, 128 kB, 256 kB and 512 kB of embedded high-speed flash memory. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, these microcontrollers are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. With a wide range of serial communications interfaces and on-chip SRAM options of 8 KB, 16 KB, and 32 KB, they are very well suited for communication gateways and protocol converters, soft modems, voice recognition and low-end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit 8-channel ADC(s), 10-bit DAC, PWM channels and 47 GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable for industrial control and medical systems.

G. IR Obstacle Sensor

An IR based obstacle sensor is connected here. The 50 ohm resister is used for current limiting. The current through the LED is 5v / 50 ohm = 100 m amp, which is high for an LED. But to increase the range of the obstacle sensor a lower range resistor (50 ohm) can be used.

On the receiver side we have connected the IR receiver in reverse bias. So as soon as the light falls in the IR receiver, the anode voltage increases and when the anode voltage is more than the cathode voltage then the LED is in forward bias mode and start conducting.

H. Load Cell

The LOAD cell will continuously give the weight readings in voltage format, which is then given to a signal conditioning unit which amplifies the voltage and is then give to the µC. The µC then converts the analog signal to digital format.

A Load cell is a transducer that is used to convert a force into an electrical signal. This conversion is indirect and happens in two stages. Through a mechanical arrangement, the force being sensed deforms a strain gauge. The strain gauge measures the deformation as an electrical signal, because the strain changes the effective electrical resistance of the wire. The electrical signal output is typically in the order of a few millivolts and requires amplification by an instrumentation amplifier before it can be used. The output of the transducer can be scaled to calculate the force applied to the transducer. The various types of load cells that exist include Hydraulic load cells, Pneumatic load cells and Strain gauge load cells.

I. Strain Gauge Load Cell

Although strain gauge load cells are the most common, there are other types of load cells as well. In industrial applications, hydraulic (or hydrostatic) is probably the second most common, and these are utilized to eliminate some problems with strain gauge load cell devices. As an example, a hydraulic load cell is immune to transient voltages (lightning) so might be a more effective device in outdoor environments.

J. RS 232

RS 232 is a serial communication cable used in the system. Here, the RS 232 provides the serial communication between the microcontroller and the outside world such as display, PC or Mobile etc. So it is a media used to communicate between microcontroller and the PC. In this, the RS232 serves the function to transfer the edited notice (or data) from PC (VB software) to the microcontroller, for the further operation of the system.

In this way, by capturing image and by processing display will show the color, size, shape and weight of respective fruit.

III. ADVANTAGES

1) It requires less time.
2) Quick response time
3) Fully automated system
4) Robust system, low power requirement.
5) As it is a nondestructive testing, the products or goods which is under testing does not damage.

IV. CONCLUSION

This paper presents basic details about the procedure of fruit security method. It includes architecture of PLC, working stages etc. As it is a nondestructive testing, the products or goods which is under testing does not damage. This is one of the advantage of this checking method. A brief working of different stages has been described in this paper. It can be concluding that the Fruit testing method using Microcontroller is most simple & effective way in the field of fruit/ vegetable checking. This paper may act as a guiding material for those who want to know about the basics of fruit/vegetable checking method.

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