Embedded System Based Fruit Grading and Sorting Management Using PIC Microcontroller

Yogina Mule[1], Pooja Bramhe[2], Jayshri Surjagade [3], Sneha Bhusari[4], Swati Khaparde[5], Venoo Salam[6], Chaitali Zade[7]

[1,2,3,4,5,6,7] *KDK COLLEGE OF ENGINEERING UMRER*

Abstract- **This paper aims at presenting the concept of fruit quality management, a system which determines the quality of fruit by its color, size and weight. Sorting tons of fruits manually is a time consuming, costly, and an inaccurate process. This sorting system is developed in order to increase the quality of food products made from fruits. The sorting process depends on capturing the image of the fruit and analyzing this image using image processing techniques to discard defected fruits. The main emphasis is to do the quality check with a short span of time so that maximum number of fruits can be scrutinized for quality in minimum amount of time. The absolute reference point is the way to perceives and interpret the quality of fruit. This system performs the sorting using MATLAB software and gives some advantages over traditional practices.**

INTRODUCTION

In order to improve the fruits' quality and production efficiency, to reduce labor intensity, it is necessary to research nondestructive automatic detection technology. Fruit nondestructive detection is the process of detecting fruits outside quality without any destructive, using some detecting technology to make evaluation according some standard rules. Nowadays, the quality of fruit shape, default, color and size and so on cannot evaluate on line by using traditional methods. With the development of image processing technology and computer software and hardware, it becomes more attractive to detect fruits' quality by using vision detecting technology. At present, most existing fruit quality detecting and grading system have the disadvantage of low efficiency, low speed of grading, high cost and complexity. So it is significant to develop high speed and low cost fruit size detecting and grading system. Food and other biological products are valued by their appearance. 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. This system performs the sorting and quality check using MATLAB software and gives some advantages over traditional practices such as follows:-

1. Efficient way for fruit sorting
2. Less time delays
3. Quick response time
4. Fully automated system with low power

CONCLUSION

The system proposed here is a display model. In this paper, a framework for the defect segmentation of fruits using images is projected and valued. For a large scale production the number of cameras and length of conveyor system can be modified according to our requirements in future. Novel incorporated techniques for sorting and grading of different fruits are presented here. Usually image confine is a great challenge as there is a chance of high uncertainty due to the external light conditions, so the advantage of gray scale image is taken into account, which are less effected to the external environment changes as well as beneficial for finding the size of a fruit. Further MATLAB coding will be identified for different images of fruit in order to improve the efficiency.

LITERATURE REVIEW

Hongshe Dang, Jinguo Song, Qin Guo have proposed fruit size detecting and grading system based on image processing. The system takes ARM9 as main processor and develops the fruits size detecting program using image processing algorithms on the QT/Embedded platform. Authors in have proposed system which finds size of different fruits

and accordingly different fruits can be sorted using fuzzy logic, here author proposed MATLAB for the features extraction and for making GUI. John B. Njoroge. Kazunori Ninomiya. Naoshi ondo and Hideki Toita have developed an automated grading system using image processing where the focus is on the fruit's internal and external defects. The system consists of six CCD cameras. Two cameras are mounted on the top, two on the right and another two cameras mounted on the left of the fruit. X-ray imaging is used for inspecting the biological defects. Image processing is used to analyze the fruit's features; size, color, shape and the grade is determined based on the features. The developed system is built from a combination of advanced designs, expert fabrications and automatic mechanical control.

HARDWARE REQUIREMENTS

➢ Microcontroller AVR ATMEGA16: AVR is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about RISC and CISC Architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz.ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000; respectively.ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD.
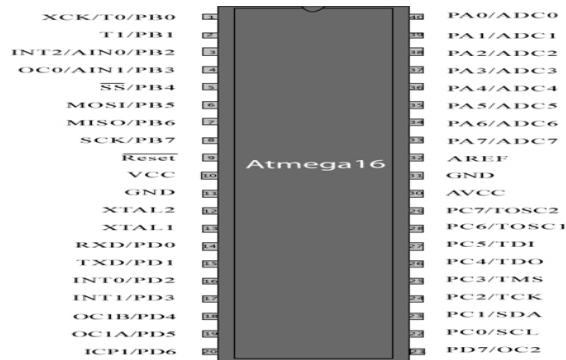

Fig. (4.1). Microcontroller PIC16F877A

➢ IR SENSOR: Here we have 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 below the camera. After this pulse is detected the µC then stops the conveyor and gives an indication to PC via RS232.The camera then clicks a photo of fruit and MATLAB software on PC

➢ LCD DISPLAY UNIT: Here we are using a 16 character by 2 line display in our project. The main objective to use LCD is to display the weight of the fruit and also to display the various processes and results obtained once the sorting process is complete.

DC MOTOR: A DC Motor is any of class of rotary electrical machines that convert electrical energy into mechanical energy. The most common types rely on the forces produce by magnetic field. We are using 12V DC motor to drive the DC motor based conveyor. The µC cannot provide the current required by the DC motor, so we are interfacing a DC motor driver L293D, which is used to drive the 12V DC Motor.
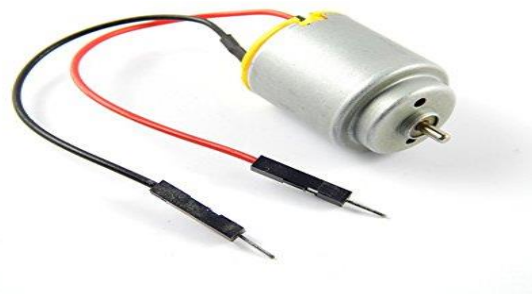

Fig.(4.6)Power Supply

➢ POWER SUPPLY: A power supply unit converts mains AC to low voltage regulated DC power for the internal components of a computer. Modern personal computers universally use switch mode power supplies. Some power supplies have a manual switch for selecting input voltage while others automatically adapt to the main voltage. Most

modern desktop personal computers power supplies conform to the ATX specification which include forms factor and voltage tolerance .ATX power supplies are turned ON and OFF by a signal from the motherboard.

CONVEYER BELT: It is the carrying medium of belt conveyor system. A conveyor belt is a system is one of many types of conveyor system. A belt conveyor is a system consist of two or more pulleys with an endless loop of carrying medium. The conveyor belt that rotates about them one or both of the pulleys are powered, moving the belt and the material on the belt towards. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley. Conveyors are durable and reliable components used in automated distribution.

SOFTWARE REQUIREMENT

1. MATLAB- is a high performance language for technical computing. It integrates computation, visualization and programing in an easy to use environment where the problems in familiar mathematical notation. Typical uses include: Math and computation, Algorithm development modeling, simulation and prototyping data analysis , exploration ,and visualization. The name MATLAB stands for matrix laboratory . MATLAB was originally written to provide easy access to matrix software develop by the LINPACK and EISTACK project , which together represent the state of the art in software for matrix computation.

APPLICATION

These parameters will play valuable role for quality analysis process, further this research work can be used for grading and sorting of fruits for agricultural products with the help of digital images (any format) which involve image analysis, visual examination and inspection of color. It used in industries for sorting and grading the fruits.

ADVANTAGES

➤ It reduce the man power.
➤ The embedded grading system has the advantages of high accuracy of grading .
➤ It has low cost and high speed.
➤ It save the time.