

# International Journal of Advance Research in Computer Science and Management Studies

Research Article / Survey Paper / Case Study

Available online at: [www.ijarcsms.com](http://www.ijarcsms.com)

## Weight Based Fruits Sorting System

Suresh S. Shendage<sup>1</sup>

Dept. Of E&TC

Dr. D Y Patil School Of Engineering Charholi (BK),

Via Lohegaon

Pune-412105, Maharashtra, India

Loukik P. Narawade<sup>2</sup>

Dept. Of E&TC

Dr. D Y Patil School Of Engineering Charholi (BK),

Via Lohegaon

Pune-412105, Maharashtra, India

**Abstract:** *Sorting of fruits is performed primarily by visual inspection using size as a particular quality attribute. Many industries with capability of large-scale buying and selling of fruits & vegetables, are using image processing technology for sorting purpose. But the image processing system of sorting requires very highly developed technology of image capturing and processing which is very costly and not suitable for small traders. The proposed sorting system in this paper offers an economical solution for such level of automated fruit sorting practices. By dealing with an automated material handling system, it aims in classifying the fruits by weight which is coming on the conveyor, by moving the fruits near its respective packing place. There by the monotonous work done by human is eliminated, achieving 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 arrangement is ideal. This sorting system presents a precise, reliable, 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 minimize error.*

**Keywords:** *Visual Inspection, image Processing, small traders, conveyor, weight, quantitative sorting.*

### I. INTRODUCTION

Agriculture sector plays an important role in economic development of India. As compared with development in electronic and automobile sector, development in agriculture sector is very slow. Hence, there is a need to come up with some novel techniques so as to fore front the agriculture sector again. As fruits plays vital role in day today life, sorting of fruits is necessary in evaluating agricultural produce, meeting quality standards and increasing market value. It is also helpful in planning and packaging. In India, human power in agricultural sector is widely used [1]. If the sorting and grading is done through manual techniques, the process will be too slow and sometimes it will be error prone. After the harvest, fruits and vegetables like apples, avocados, cherries, citrus, kiwifruit, onions, pears, peppers, potatoes, salad, strawberries, stone fruit, tomatoes, etc. of all types have to be sorted, packaged and transported. A wide range of technologies have been developed or refined over the years for sorting according to color, density, diameter, shape and weight[2]. Industrial automation is increasingly getting important in the sorting process because computers or machines are capable of handling repetitive task quickly and effectively. Thus machines are also capable to sort fruits according to the grades without mistakes. In this automation system, which comprises of mechanical structure in addition with electronics segment separately, is designed to be used in small agricultural industries. There are several reasons to need this machine as a solution for agriculture industrial problems. Nowadays, usage of human power especially in agriculture sector is critically and widely use. One of these project objectives is replacing man power with machine. Usually a lot of human error occurs during the process of fruit sorting. Therefore this system is proposed to minimize or overcome those errors. Usually people can work around 7-8 hours per day. Working more than this period sometimes, makes the workers lose their focus and to concentrate on the job becomes challenging for them. Automation systems nowadays are chosen to overcome this problem and moreover the designed system produces efficient and high productive results. Usually in industries, designed machines are big in size, therefore are not portable.

The aim is to design a fruit sorting machine which is portable. For this, the main task is to integrate AVR microcontroller as a main control system with entire electro-pneumatic system. ATmega16 microcontroller is used to control the sequence of operations performed by the system. This project is divided into two major sections. First is mechanical part and another one is electronics segment. The mechanical part includes conveyor assembly, while the electronics part consists of PCB designing and mounting of various electronics components with the microcontroller.

## II. LITERATURE SURVEY

HongsheDang, JinguoSong, QinGuo [1] have Proposed fruit size detecting and grading system based on image processing .The system takes ARM9 as main processor and develops the fruits sized detecting program using image processing algorithms on the QT/Embedded platform. Authors in[2] have proposed system which finds size of different fruits and accordingly different fruits can be sorted using fuzzy logic ,here author proposed mat lab for the features extraction and for making GUI.

John B.Njoroge. Kazunori Ninomiya. NaoshiK on do and HidekiToita 3] 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 in spacing 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 advance designs, expert fabrications and automatic mechanical control. J.V. Frances, J. Calpe, E. Soria, M. Martinez, A. Rosado, A. J. Serrano, J. Calleja, M. Diaz[4] presented a procedure to improve the performance, whether increasing speed or accuracy, of the load-cell-based weighting subsystem in a fruits or ting and grading machine to achieve an accuracy of  $\pm 1$  gram.

Wong Bing Yit, Nur Badariah Ahmad Mustafa, Zaipatimah Ali, Syed Khaleel Ahmed, Zainul Abidin MdSharrif [5] proposed new MMS-based system design and developed with signal processing for fruit grading for consumers. The prototype network architecture, integration of wireless messaging system with signal processing between mobile consumers for development purposes was studied, proposed and designed.

## III. NEW APPROACH

This paper suggests an integrated system which provides a whole new different option for grading fruits. It aims in classifying the fruits by weight. The fruits will be weighed first and then moved on the conveyor. The conveyor will convey each fruit to its respective weight category storage unit thereby eliminating the monotonous work done by human, achieving accuracy and speed in the work. Thus weight of fruit is used as a design metric to sort for which load cell arrangement is used.

## IV. CONCLUSION SYSTEM MODELING

The complete system is divided in four main parts:

### 1. Conveyor Belt:

A single motor driven conveyor system is the major segment of this system. The fruits to be sorted will be conveyed by this conveyor for further proceedings.

### 2. Load Cell:

A load cell assembly is placed at the flinch of the conveyor system. Weight of each and every fruit to be sorted will be calculated here and then moved on to the conveyor.

### 3. Pushing Arm:

Pushing arms are installed at certain distances on the conveyor to move the fruit from the conveyor according to the fruit's weight.

#### 4. Baskets:

Baskets are used to load the fruits. For every class of weight a separate basket is allotted. The fruits on the basis of their respective weight class will be pushed by the arms into these baskets.

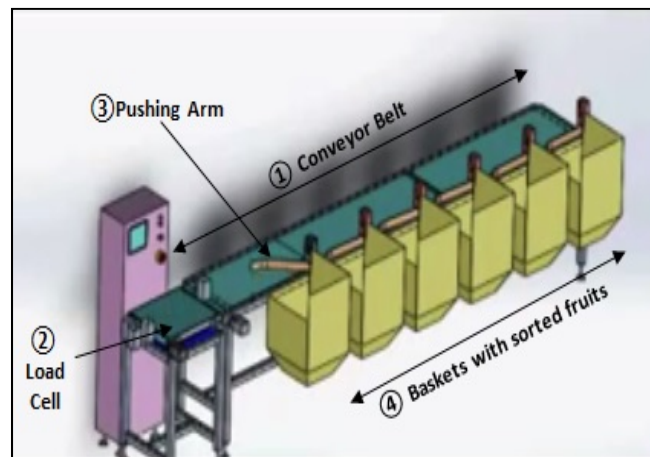


Fig. 1 Sketch diagram of whole sorting system

#### V. BLOCK DIAGRAM

The hardware consists of motors which are driven by motor driver circuit on the control of ATmega16 microcontroller.

One main motor is allotted for conveyor mechanism while the other motors are utilized for sorting mechanism, which is

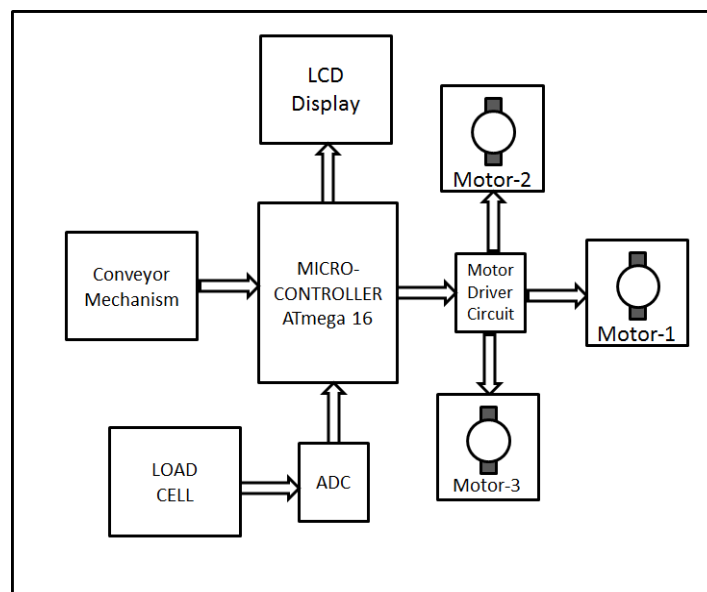
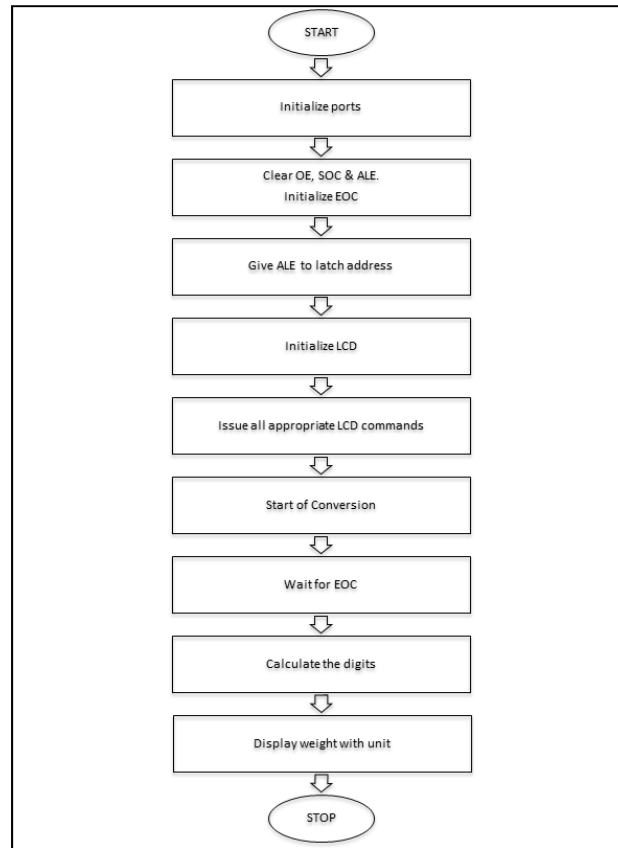


Fig.2. Block Diagram of whole System

Performed by the pushing arms. Load cell which is also interfaced with the microcontroller, is used for weight measurement. Weight of each and every fruit after weighing is instantly displayed on an LCD.



*Fig.3 Flowchart for measuring and displaying weight*

An algorithm for sorting mechanism of fruits in three weight categories is as follows:

- a) Start
- b) Initialize UART
- c) Initialize ADC
- d) Check whether fruit is present on the load cell or not.
- e) Calculate weight (Start ADC Conversion) and store it in variable 'w'.
- f) Display the weight on LCD
- g) Rotate motor of conveyor for calculated weight.
- h) Three weight range has been decided
  - i. less than a,
  - ii. between a and b and
  - iii. Greater than b.
- i) If calculated weight  $w \leq a$ , then Arm 1 sorts the fruit.
- j) If calculated weight  $a < w < b$ , then Arm 2 sorts the fruit.
- k) If calculated weight  $w > b$ , then Arm 3 sorts the fruit.
- l) Perform all the above steps until all the fruits get sorted.
- m) End

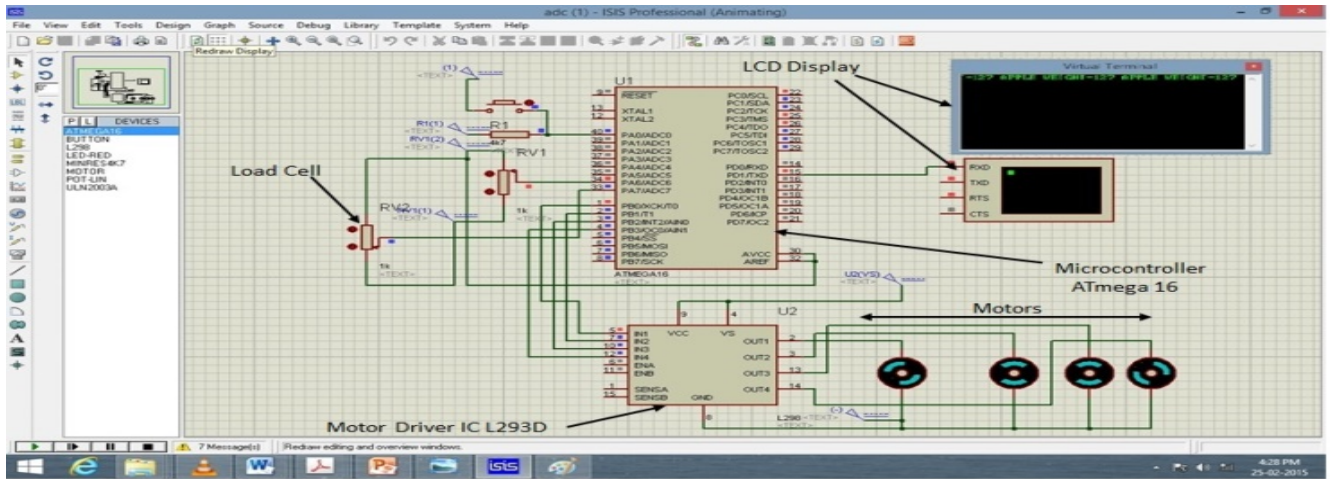


Fig. 4 Simulation of whole circuit diagram on the Proteus Software

## VI. CONCLUSION

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 consists of mechanical and electronics segment. The design of mechanical part includes a conveyor assembly and few motors whereas the electronic system consists of a sensor (load cell), microcontroller and motor driver. Microcontroller reads data from the load cell and drives the motor using motor driver in accordance of load cell's readings. This embedded system leads to a low cost and compact device which is easy to adopt as well as will have low maintenance cost. Automated sorting system not only speeds up the time of the process but also minimizes error.

## VII. 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 getting sorted.

In addition 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 accuracy of sorting and hence the overall efficiency of whole sorter.

## ACKNOWLEDGMENT

The author would like to thanks the researcher as well as publisher for making their resources available and teacher for their guidance. Finally, we would like extend a heartfelt gratitude to friends and family members.

## References

1. "State of Indian Agriculture 2011-12", Server-3\3832AGRI\Final Report SIA-Press\Index
2. Manoj B. Avhad, Satish M. Turkane, "Arm based Fruit Grading and Management System Using Image Processing", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), Volume 2, Issue 1, January 2013, ISSN: 2278-1323.
3. Hongshe Dang, Jinguo Song, Qin Guo, "A Fruit Size Detecting and Grading System Based on Image Processing," 2010 Second International Conference on Intelligent Human-Machine Systems and Cybernetics, pp83-86.
4. Harshavardhan G. Naganur, Sanjeev S. Sannakki, Vijay S Rajpurohit, Arunkumar R, "Fruits Sorting and Grading using Fuzzy Logic," International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 1, Issue 6, August 2012, pp 117-122.
5. John B. Njoroge, Kazunori Ninomiya, Naoshi Kondo and Hideki Toita, "Automated Fruit Grading System using Image Processing," The Society of Instrument and Control Engineers (SICE2002), Osaka, Japan, August 2002, pp 1346-1351.
6. J. V. Frances, J. Calpe, E. Soria, M. Martinez, A. Rosado, A.J. Serrano, J. Calleja, M. Diaz, "Application of ARMA modeling to the improvement of weight estimations in fruit sorting and grading Machinery," IEEE 2000, pp 3666-3669
7. Wong Bing Yit, NurBadariah Ahmad Mustafa, ZaipatimahAli, Syed Khaleel Ahmed, Zainul AbidinMdSharrif, "Design and Development of a Fully Automated Consumer-based Wireless Communication System For Fruit Grading", ISCIT 2009 ,pp 364- 369.

**AUTHOR(S) PROFILE**



**Suresh S. Shendage**, pursuing BE (E & TC) in Dr. D.Y. Patil School of Engineering from the Pune University.



**Loukik P. Narawade** , pursuing BE (E & TC) in Dr. D.Y. Patil School of Engineering from the Pune University