# SIZE BASED OBJECT DETECTION AND SORTING

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## ABSTRACT

*In this project we purpose to size detection and sorting of object by use of conveyor belt. The real challenge is how to complete existing sorting mechanism in the modular processing system. Which consists of three integrated stations of identification, processing and sorting. Existing sorting method uses a set of sensors to do differentiate object size.*

*In this we use sensors to detecting the size of object and sorting with using 8051 microcontroller. The project deals with an automated parcel handling system. It aims in classifying the object by size which are coming on the conveyor by pushing the object in its respective area. There by reducing the monotonous work by human and achieving accuracy and well speed in the work.*

*This involves sensors that determine the object size and sends the signals to the 8051 microcontroller. The 8051 microcontroller is drives the various motors of the cam pushing mechanism and the object is pushed to specified location.*

*Keywords: Conveyor Belt; IR Sensor; Striking Mechanism;8051 Micro-controller; Automation; Sorting.*

## INTRODUCTION

Today we are moving towards a world of automation systems. The applications of automation is not only limited to computers and communications, they are also involving in every field. In this day and age of computers there is automation is becoming sensing, monitoring and applying the changes per millisecond involved in experiment with accuracy. The continuous or constant tasks with accuracy and sensitivity can be done using automated instruments.

Determining actual time and highly accurate properties (predetermined) of small objects in a flowing stream would open new directions for industrial sorting processes.

This project relates to an apparatus and method for classifying and sorting object based on their size, using automatic systems and additional sensors[1] operating on the basis of a dimensional characterization of each element. By another way this project is deals with automated material handling or controlling system & can be designed by following way. That synchronizes the movement of cam pushing mechanism to push the objects conveying on a conveyor belt. That aims inclassifying the different objects which are coming on the conveyor by pushing the objects in its respective preprogrammed place. Thereby eliminating the work done by human, achieving required accuracy and high speed in the work.

In this project we involves sensors that sense the object's size and sends the signal to the PC. The PC sends signal to microcontroller based circuit which drives the various motors of the cam system to

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push the object in the specified location. Based upon the size detected, the cam stick push object to the specified location.

Sorting is very important in any type of industry or field such as manufacturing field to increase the efficiency of manufacturing processes and easy material handling.The main aim of this task performed here is to sorting the products manufactured in the company or industries. The main purpose of this project is to save the time for inspection and to reducing the efforts of the workers in material handling.An automatic sorting machine has important task of sorting object according to the sizes .In this we also use conveyor belt, which reduces the efforts of material handling or controlling.

## COMPONENTS

A. *Pulleys:*

There are several reasons like loading on belt, soiling, slipping, etc can cause the belt run crooked. To prevent all of the above causes we use two rollers which are act like pully to the belt on which the belt can smoothly without any kind of disturbance.

B. *Driving unit:*

We used 12 volts DC gear motor to drive the pulley. Polymer bar is used as the coupling between the motor and shaft of pulley.

C. *IR(infrared) sensor[2]:*

It is the device which is used for the detecting purpose. There is beam of light come out from the sensor if the beam will cut by the object then it gives signal to the microcontroller and give the command to the striking mechanism. So the IR sensor is used as the object sensing purpose.

D. *Controller[3]:*

We are using 8051 microcontroller for our sorting system. It is the brain of our system. It have 40 ports. Each port can perform different kind of functions as per coding.

E. *Limit switch[4]:*

Limit switches are used for the striking mechanism. There are two limit switches on each striker. When striker strikes the object there is a limit from which should no go further and it should be return to its position because of that limit switches are used.

F. *Power supply:*

We are using self-made power supply. The power supply we made can take 240 volt and can convert it into the 9volt and 15 volt.

G. *Conveyor belt[4]:*

There was mainly two types of conveyor belt are used in industries, bulk conveyor belt and general purposing belt. But the bulk conveyor belt are used for heavy load transport so we used general purposing belt in our project.

H. *Conveyor support:*

There is a main platform on which the belt is held and the material of the base is ply wood. We used rectangular blocks of timber wood. Two of the blocks are bolted fix on the base and other two can be slide on the base as per requirement of fitting of belt. We have there conveyors of this type, one is main conveyor and other two are auxiliary conveyors.

# CONSTRUCTION OF CONVEYOR BELT

I. *Cutting/Sawing:*

Wood block available in the form raw material by cutting /sawing wood convert in a form of base and prepare in a form of pillar with a desired dimension.

J. *Machining:*

Manufacturing a pulleys according to design from teak wood (row material) in the form of block with the help of lathe machine by turning operation.

K. *Bearings:*

For the frictionless rotation and reduce power loss fitted bearing. Took the bearings as required for fitting the shaft and then fit that bearings in the wood pillars.

L. *Slotting:*

Generally all the belt loos due to wearing and tearing of belt due to this effect on performance of system .For overcome the problem use length adjustment mechanism, in which use slotting/bolt mechanism for this slotting the base in a desired dimensions and tolerances with accuracy and alignment.

M. *Polish of wood:*

Polish the wooden block by a polish paper and make smooth surface for safety and aesthetic purpose.

N. *Bolting / Screwing:*

For the Quick assemble-disassemble and easily movement of the model component, the bolt and screw are use for fabricate. Pillars and base are fabricated by the nut bolt and screw. Also motor clamps clamped by a screw.

O. *Alignment:*

For the better and accurate performance need to proper alignment of shaft and proper adjustment of pillars with bearings. Also need alignment for constant rotation with constant torque.

P. *Drive unit:*

For drive a belt, electric motor of 12V and 60RPM coupled with the pulley shaft with care of alignment. And controller and IR (Infrared Sensor) run by 5v.

Q. *Building a conveyor belt:*

According to design, belt cut and set on the pulley with proper dimensions and alignment.
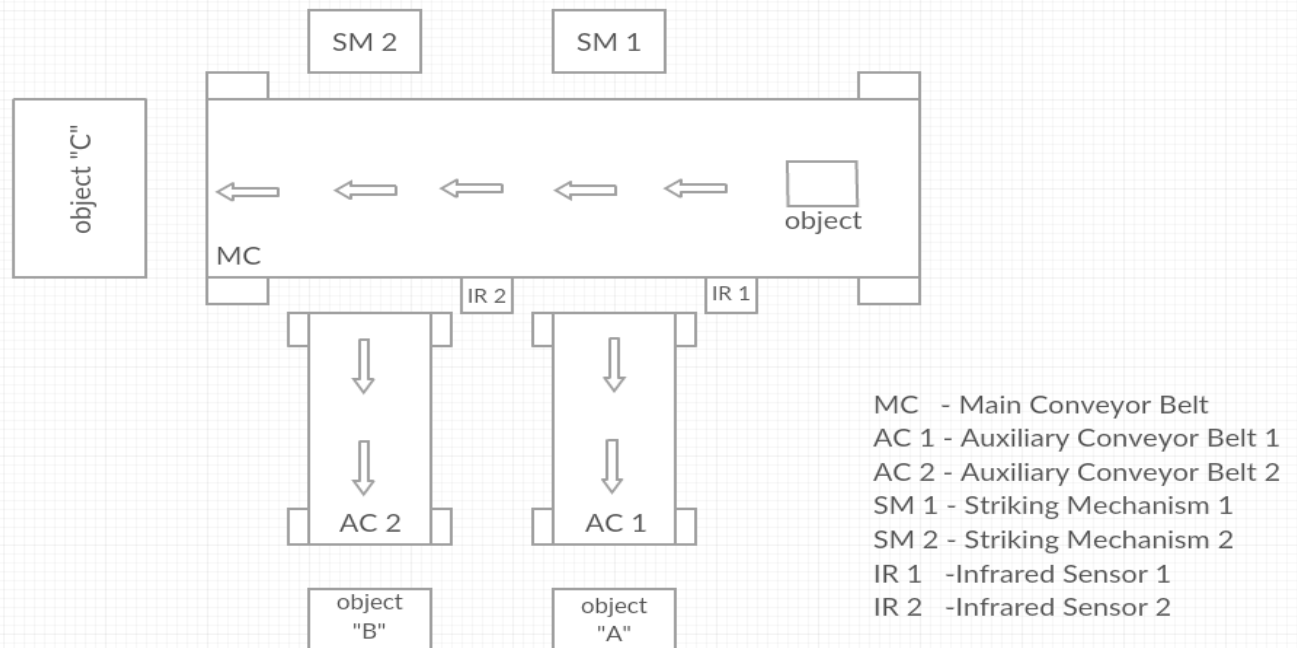
## ARRANGEMENT OF COMPONENTS



Figure 1. Arrangement Of Components

Our project contain three conveyor belt, one is main conveyor belt and two other auxiliary conveyor belt. Object enter with the main conveyor belt, the striker mechanism located in-front of the each auxiliary conveyor belt, as an object easily move on the auxiliary conveyor belt by the striking mechanism. The IR sensor arrange before the striker mechanism according to the function of our project all the components controlled by the 8051 microcontroller. There are three product storages as we required for our three different size products.

All the motors are connected with the 8051 micro-controller. All the three conveyor belt have one-one motor to rotate the conveyor belt and transport the object to one end to another end. 8051 microcontroller give output to the motors and rotate clockwise and anticlockwise. The position of IR sensor is important for the sorting purpose of the objects.

There were two striker mechanism used for strikes the object as per size detection. But the controller controls the movement of striker. Controller takes input from IR sensor and give output to striker.

## WORKING

This system is based on detection of the size of object and sorting of object. In this the object pass through the main conveyor belt. We make this system fully automatic. All the process are done by step by step orders. We can also called this system as an embedded system. We explain the working by flowchart that explain as below:
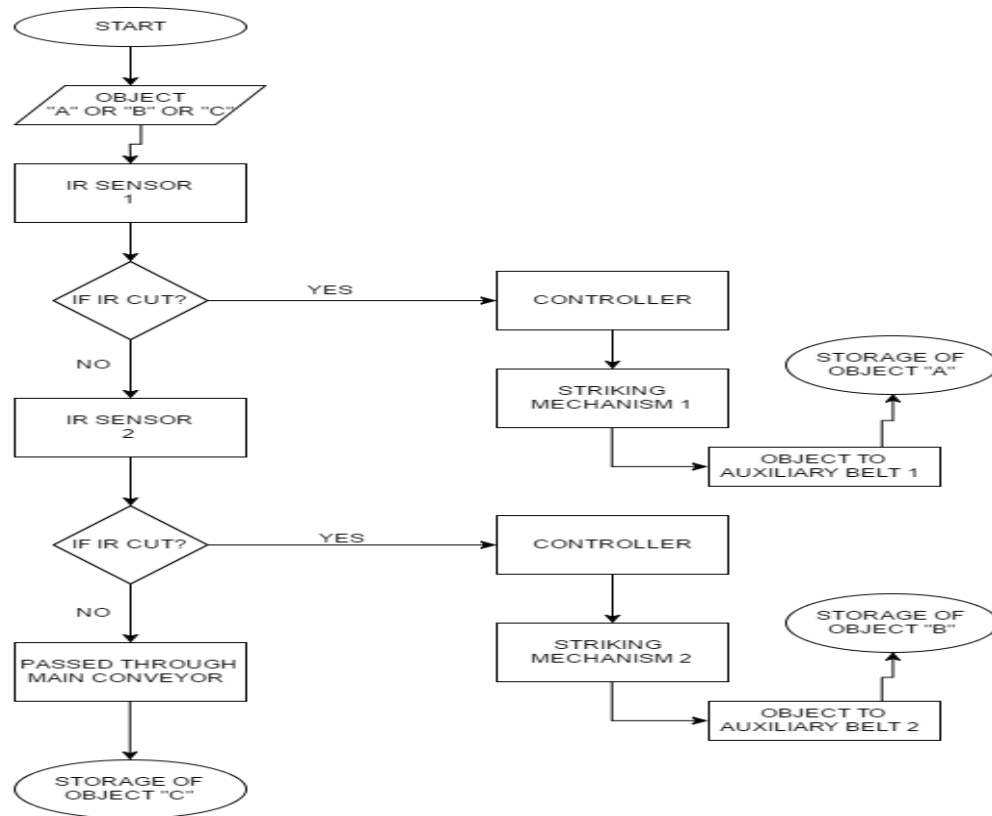
Figure 2. Flowchart for Working of System

As shown in flowchart, there are three different size of objects are sorting by this system. Object "A" is big size, object "B" is medium size and object "C" is small size. The IR sensors are placed at the different height near the conveyor belt to sense the object. At the initial state system doesn't know the size of object. Here the meaning of size is only sensible size by sensors and not in number
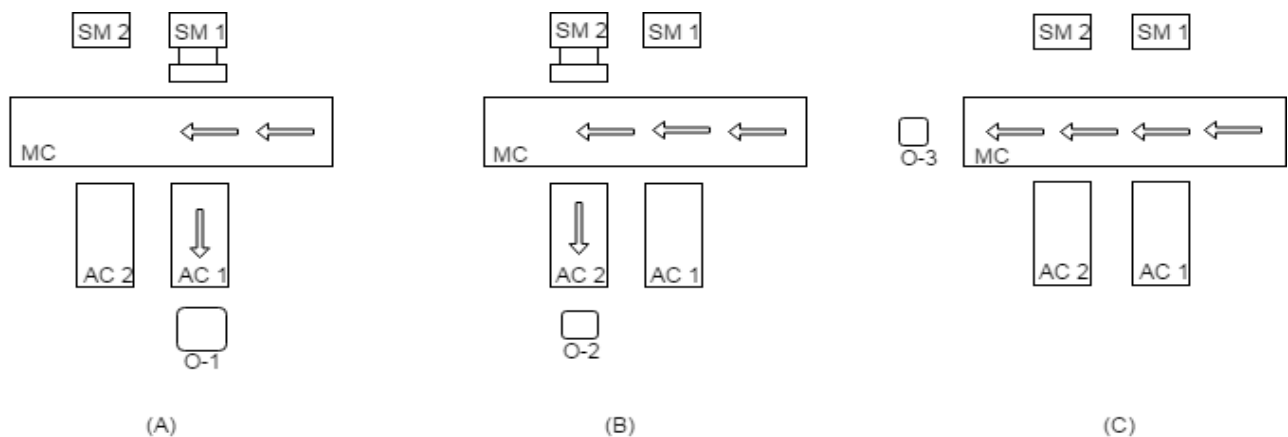


Figure 3. Sorting of Object

Figure 3. Indicates the sorting process of three object a, b, and c respectively. For object "A", it is the large size object so IR 1 is stands for sensing the large size object and sends the signal to the micro controller. Here IR (infrared sensors) are used as the input device, they give input signal to the

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controller. Then the system know the sensible size of object. Because of the object "A"(large size), controller sends the signal to the striker mechanism SM 1.After getting strike by striker mechanism, the object transfer from the main conveyor to the auxiliary conveyor AC1 as shown in the flowchart. At last the object "A" reach at the proper place (storage).

For object "B", it is the medium size object so IR 2 is stands for sensing the medium size object and sends the signal to the microcontroller. Because of the object "B" (medium size), controller sends the signal to the striker mechanism SM 2.After getting strike by striker mechanism, the object transfer from the main conveyor to the auxiliary conveyor AC2 as shown in the flowchart. At last the object "B" reach at the proper place (storage).

For object "C", here we also take the advantage of main conveyor belt. For the sorting of object "C", there is no any IR sensor stands for sensing the size of it. We use simple logic,  if IR1 and IR2 are not cut by object then the object doesn't strike by any striker and direct reached at the another end of the main conveyor belt as shown in Figure 3.

## FUTURE SCOPE

Also we can use such system with some modification for various types of inspection such as inspection parameter:

- Diameter, hole diameter

- Height

- Thickness

- Surface defect

- Crack

- Roundness

- Minor and major diameter

- Chamfer angle etc.

In present model it is possible to extend the work as discussed below:

- We also add the sensor (Device) which counting no of object to be sorted.
- In large food processing company large network of conveyor is possible with various types of sensor.
- This project is more flexible in which sorting by sized as well as barcode, color, number, image, crack detection etc.

## ACKNOWLEDGEMENT

## CONCLUSION

This project sized based object detection and sorting by conveyor is effective and worth system for different applications in which it is ensure that no damage the parcel or object during sized detection and sorting .this being the major function of the system .It perform with full satisfaction. It provide huge economic benefits for mass or batch quantity sorting.

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