A Review of Automatic Color Sorting Machine Using IR Sensor and Arduino

[1]Rahul Dhiman, [2]Manmeet Singh, [3]Munish,[4]Gurpreet S Malhi, [5]Dr. Jaswanti

[1,2,3]*Student, Chandigarh Engineering College Chandigarh Group Of Colleges Campus, Landran, Punjab.*
[4]*Assistant Professor, Chandigarh Engineering College Chandigarh Group Of Colleges Campus, Landran, Punjab.*
[5]*Lecturer,Chandigarh College of Engineering & Technology, Diploma Wing, Chandigarh, India*
Corresponding Author: Rahul Dhiman

ABSTRACT: The Automatic Sorting Machine is used to sort different types of products or commodities based on the barcode provided on them. This gives a provision to reduce the manual effort and hence human error by replacing the conventional methods of sorting in areas involving hectic sorting. The system comes into play in airports and other industrial distribution centres where the products or commodities have to be sorted into batches in order to take them to their respective destination. In the speed running world everyone are considering of time factor as an important issues. To reduce this time or managing this time, a smallimplementation which is useful to industries is our work as Black Element Detecting Machine. Todayin industries, same model or same object is manufactured with little variation like color, size..etc. For placing the same type of object form one place toother place, sorting them on color and size bases we use labor, so for this all industries will spend huge amount as wages and take lot of time forprocessing. By considering all this we made a research on Black Element Detecting Machine which make at thisi.e., sorting of object based on black color.

KEYWORDS: Arduino, conveyor belt systems, IR Sensor,Relay module.

I. INTRODUCTION

Inthe present world, there are plenty of scientific innovations and sophisticated technologies that has simplified human life and raised the standard of living. Scientists are busy with the research and development works. Day-by-day scientists come up with better ideas that make the life of common man more automated [1-2].

As an attempt to develop an automated set-up in whatever area possible which would further simplify human life and make it easier, we ended up with the very relevant area of concern - sorting.

The sorting of different kinds over wide area has proven to be an important part in every sector. So as to accomplish the work of sorting, manual efforts were put in. Earlier, the manual involvement has been commonly imparted for the sorting process from small-scale industries to comparatively high-level large-scale industries. But, due to increase in competition in the global market, the so-called big companies and industries started seeking for better technologies that would reduce human effort and hence the consequent errors which in turn would help them increase their productivity and meet the increasing demand. This further would help them take a huge profit in return and thus the growth of that firm gets kick-started. As a result, the advent of automation in sorting sector has become a boon for such industrial sector. In large-scale industries and multi-national companies, the manual sorting is very less or nearly nil. This has further improved the product quality and reliability as a whole [3-4].

In various other places where sorting comes into play predominantly are airports, seaports, small-scale industries, super markets, etc. But due to the restricted reach of automation in sorting in these sectors, the thought about automated sorting in such fields ought to be considered with much importance. Thus, to extend the advantages of automated sorting in large-scale sectors to the above mentioned sector, a notion of automation has been thought to implement in small-scale sectors [5].

With this in mind, we set out for a search throughout to gather more ideas and simpler technologies to implement to realize our notion. Thereafter, we thought of selecting a barcode sorted technology since most of the products are with a barcode on them [6-7]. This would further simplify our job, hence, giving clarity on how the products need to be sorted. The gadgets required for the implementation of this system were also easily available and without much complicated circuitry, the system could be set up. After a detailed enquiry about the scope and implementation of our system, we were able to collect technical papers based on sorting but using different criteria for sorting. One area was "Automatic sorting machine using delta PLC" and the other "Automatic letter sorting system for Indian postal address recognition system based on PIN codes" [8-9].

The system, which we have come up with aims to reduce the human effort and hence the consequent errors. Moreover, the system helps tackle the tedious sorting process by mere barcode scanning done on the selected products. It, furthermore, promotes speed and reliability of sorting [10].

We have proposed simple, low cost, low power consumption component sorting unit based on its black color. When, it is placed on conveyor belt, which is running continuously with the help of D.C. motor. The objective of the research work is to sort the component according to black color. Our proposed works aims at the testing of the manufactured component by an automated way instead of using manual way. It is aimed to reduce human effort and at the same time increase the productivity & accuracy levels that cannot be achieved with manual operations. So this work of automatic black color sorting is an excellent one because of its working principle and wide implementation. By applying the idea of this research an industry can easily sort the required product according to its color.

II. PROBLEM IDENTIFICATION

In the speed running world everyone are considering the time factor as an important issues. To reduce this time or managing this time, a small implementation plan which is useful idea to industries is our project. Today in industries, same model or same object is manufactured with little variation like weight, size etc. For placing the same type of object from one place to other place, sorting them on color and size basis we use labor [3]. So for this all industries will spend huge amount as wages and take lot of time for processing.

The problem statement for the project is to create the electronic material handling system which can be used to reduce the efforts of workers as well as to reduce the time spent in inspection of the components, during their manufacturing. It also reduces the efforts in transferring the components manufactured to anther workstation. By considering this, entire project which is make all this i.e. Sorting of object is based on black color.

The block diagram for the automatic sorting using the conveyor belt is asshown below.
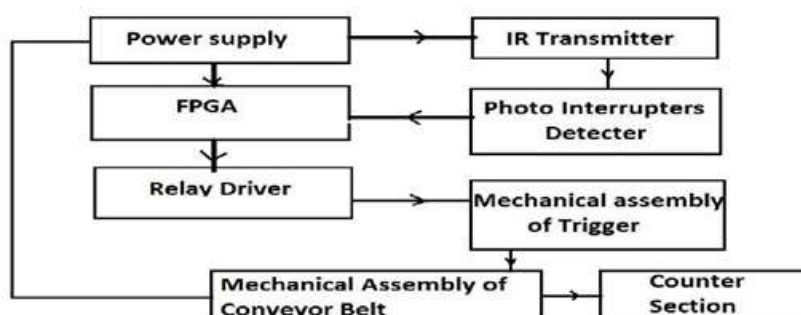

Block diagram for the system

III. EXPERIMENTATION

Our research workon **Black Element Detecting Machine** as shown in figure involves reducing the industrial cost employed in installation and functioning of multiple conveyor belt systems in different industries like Food Processing Industry, Medicine Industry etc. for sorting of different colour objects. This is achieved by setting up a single conveyor belt which carries objects and then the relay along with the IR sensor module which detects black color of the objects and then the objects are sorted accordingly. With this the operational costs, labour costs and installation costs are reduce in manifold by minimal increase of the inputs. The main components are discussed here in detail by providing a descriptive analysis of various modules required in this work.
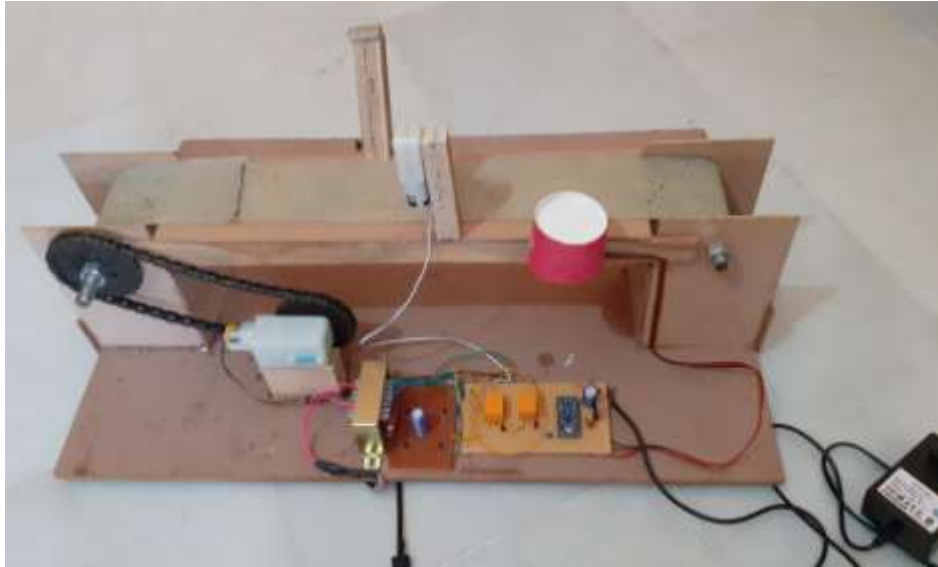
Black Element Detecting Machine

A. Sensor Module: We are using an IR Sensor for detection of object presence and Color sensor for detection of objects based on color. The operation of IR sensor and Color sensor, here are programmed such that when the object comes and when it is detected the sensor senses it for some time delay and if the object is removed during that time delay and placed again then the sensor again starts the sensing time delay from the beginning and after that the instruction of object being sensed is send to the relay.
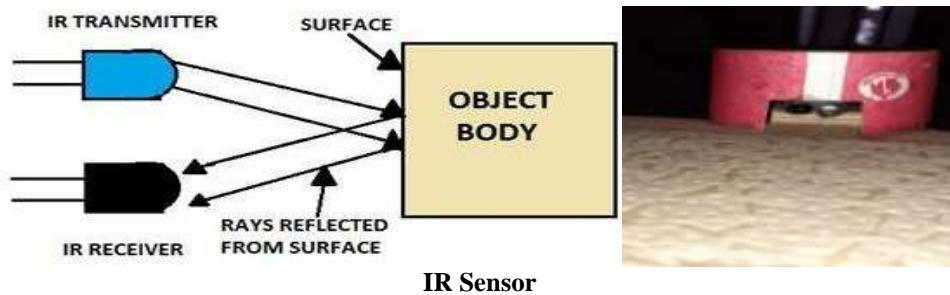
IR Sensor

B. Conveyor Belt: The conveyor belt used here consists of two pulleys with continuous chain of product one of the wheels is powered by a 14 rpm converted speed, moving the belt and the material on the belt goes forward.


Conveyor Belt

C. DC motor: A DC motor as shown in figure 6 is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor. DC motors were the first type widely used, since they could be powered from existing direct-current

lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings.

DC Motor

D. **RELAY Module:** This system 24V DC relay is used to drive the conveyor motor and solenoid. These are working with 12V DC supply. There is 24V DC level that is used in input/output of plc. There relay must be used as interfacing. The 24V DC relay is as shown in figure below. The hardware includes a board Arduino Mega 2560 V3 which is controlling the automatic sorting system, one sensor color TCS230 which detects the color of the piece, a computer power supply which is used to supply the entire system, color sensor with infrared used to detect pieces and other elements in the system, two geared motors used for removal and transport of pieces and sorting of parts. As shown in figure, it is illustrated development board Arduino Mega 2560 V3 physical connection with every element in the project.
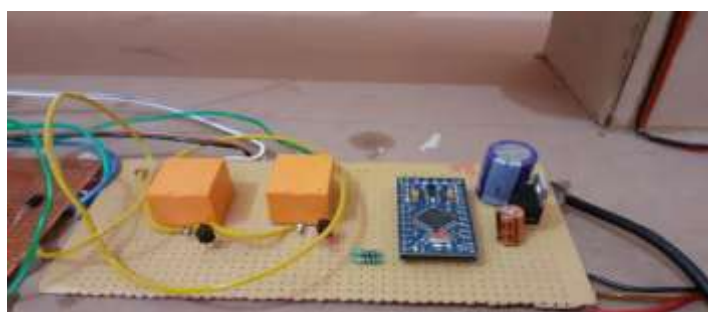
Relay module with Arduino Board

E. **Rejection Unit:** It comprises of a bridge on which the DC motor is mounted to which the flipper is attached as shown in figure. As soon as the relay module receives a signal from the IR sensor for no-black color object, the flipper is initiated and it slides the object into the rejection system. If neither of the above conditions holds true and the black color object is sensed, flipper leaves the object undisturbed and it continues on the finish end of conveyor line.

Rejection Unit

F. Software Development of the System: The monitoring structure is directly controlled by arduino and the black color sensor is controlled by arduino through the 2 relay module. The LEDs using only black color indicates that the process is correctly executed and when is not black means that in the process appeared an error and need human intervention (for example when the stack doesn't have piece need to be filled).

IV. WORKING OF THE PROJECT

1. The objects are automatically sorted according to the given conditions (If black then allow moving otherwise stop and slides to rejection side) successfully.
2. The product used for testing is a different colorproduct.
3. So now the product is kept above head pulley. Now the switch which is situated at conveyor belt is madeon.
4. Now the conveyor will start. The sensor which is situated just before pushing mechanism, will sense color of the product and the signal is sent to microcontroller.
5. There the calculations will be done and the decision has taken . The system to control the overall process of sorting of objects is done by arduino and the black color sensor is controlled by arduino through the 2 relay module.
6. After that, the product will be travelled to tailpulley.
7. The signal will be now given to pushingmechanism.
8. After identifying the product, the conveyor will be get automatically switchedoff.
9. So after stopping of the conveyor, corresponding mechanism will be get actuated as per received from the relay module program, and the products will be get sorted. The system rejects and discards objects that are not of required characteristics by pushing them out of conveyor line using a pneumatic cylinder.

Therefore, we have proposed an efficient method which uses black color sensor for identifying and separating products on the basis of color.

V. CONCLUSION

The Automatic Sorting machine like Black Element Detecting Machine makes sorting process easy, more precise and reliable. In various other places where sorting comes into play predominantly are airports, seaports, small-scale industries, super markets, etc. All these used conventional method of sorting which is manual, tiring, time consuming and often with mistakes. But due to the restricted reach of automation in sorting in these sectors, the thought about automated sorting in such fields ought to be considered with much importance.

Now days in highly competitive industrial manufacturing, the management of the integrity of supply of a product from raw material to finished product through quality manufacturing is of paramount importance. For the declaration of a product bearing high quality and dimensional accuracy is mandatory. So this project of Black Element Detecting Machine is an excellent one because of its working principle and wide implementation. By applying the idea of this project an industry can easily sort the required product according to its color. The system performed well as programmed and detects the object according to their black color. Though it has some limitations, but by having done some modification this concept can be implemented in wide range of application.

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