

SYNOPSIS REPORT ON

CONVEYOR SYSTEM WITH COLOUR BASED SEPARATION METHOD

submitted in partial fulfillment of the requirements of the degree of

III semester of Bachelor of Engineering

by

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2020-2021

CERTIFICATE

This is to certify that the mini project entitled **“CONVEYOR SYSTEM WITH COLOUR BASED SEPARATION METHOD”** is a bonafide record of the mini Project work done by **“Aadesh Gaikwad (TU5F1920068), Snehit Budhavale (TU5F1920065), Sanskaar Pandey (TU5F1920072), Sahil Choudhary (TU5F1819015)”** in the year 2020-21 of Department of Mechanical Engineering submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of III Semester **“Bachelor of Engineering”** in **“Mechanical Engineering”**.

Dr. R.S. Jaware
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MINI PROJECT REPORT APPROVAL

This mini project report entitled *Conveyor System using color based separation method* by *Aadesh Gaikwad (TU5F1920068), Snehit Budhavale (TU5F1920065), Sanskaar Pandey (TU5F1920072), Sahil Choudhary (TU5F1819015)* is approved for the III semester degree of *Bachelor of Engineering* in *Mechanical Engineering*.

Examiners:

1. _____

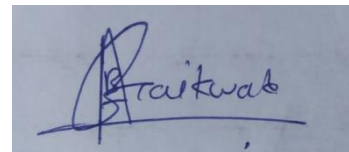
2. _____

Date:

Place:

DECLARATION

I declare that this written submission represents my ideas in my own words and where other ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.



Signature

AADESH GAIKWAD

Name of student

Date: December 7, 2020

ABSTRACT

This project is a work on control engineering or production technology. This project aims at the problem we are attempting to solve to create an automation system of product passing & separating through color difference. The products will be placed on moving conveyor belt through different colored packaging system. A color detecting device will be situated in a position of conveyor belt that will detect two different color of the packaged product and a divider will separate different colored package product to different destination. This product passing and separating to the intended destination is done by a color difference in an automatic way. In many packaging industries color object sorting and separating is a major task that needs to be done at final dispatch system. Manual sorting is a traditional approach that is preferred by industries. This approach is performed by human operators which is tedious, time-consuming, slow and non-consistent. Therefore, the efforts are made to design and implement an automatic technique of product passing & separating through color difference.

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BACKGROUND STUDY

Primitive conveyor belts have been in use since the 19th century. In 1892, Thomas Robins began a series of inventions which led to the development of a conveyor belt used for carrying coal, ores and other products. In 1901, Sandvik invented and started the production of steel conveyor belts. In 1905, Richard Sutcliffe invented the first conveyor belts for use in coal mines which revolutionized the mining industry. In 1913, Henry Ford introduced conveyor-belt assembly lines at Ford Motor Company's Highland Park, Michigan factory.

Conveyor belts have been an inseparable part of the industry after the World War II. These belts carry heavy parts which are difficult to handle manually. The main purpose of the conveyor belt is to carry the product placed on it from one point to another, safely without causing any harm to the product placed on it.

Conveyors are of huge importance in the mining, food, automobile industry, as all of them require the production lines to be running at a constant speed. The speed of the conveyors depends upon the need of the production rate, it is adjustable. The simple structure of the conveyor belt is its main feature.

Today there are different types of conveyor belts that have been created for conveying different kinds of material available in PVC and rubber materials. Material flowing over the belt may be weighed in transit using a belt weigher. Belts with regularly spaced partitions, known as elevator belts, are used for transporting loose materials up steep inclines. Belt Conveyors are used in self-unloading bulk freighters and in live bottom trucks. Belt conveyor technology is also used in conveyor transport such as moving sidewalks or escalators, as well as on many manufacturing (assembly) lines. Stores often have conveyor belts at the check-out counter to move shopping items, and may use checkout dividers in these processes.

PROBLEM STATEMENT

As mentioned earlier, the structure of the conveyor belt is too simple, that leaves no space for further modifications on it. One requires a whole lot of research to study what else can be added on it to improve it's need and maintain its importance in the current modern industry.

In today's modern industry, the production rate is high to keep up with the supply in the market. Majorly in food industries, where at a time only one type of product is made, with very minute changes.

For Example: Coca-Cola, Frito Lays, Doritos, etc. create the same product in their respective industries but, the products are separated on the basis of their flavors, and color of their packaging. The conveyors are also used in these industries but, the sorting of these products is mostly done manually, which reduces the speed of the production. There are also chances of causing error.

So, we can create a sorting system on the conveyor belt itself, which will separate out the products based on their colors, and keep the production line running at a constant speed and also minimalizing the chances of errors. This can be made possible, using sensors and different motors of certain specifications.

Hence, our project is based on creating a sorting system for conveyor belts, which will help solving the problem mentioned above.

OBJECTIVE

The main objective of this project is to create an efficient sorting system which will be of major importance in food industry. We will be using Arduino and color sensors for doing so, by programming them accordingly to identify the colors to sort them accordingly.

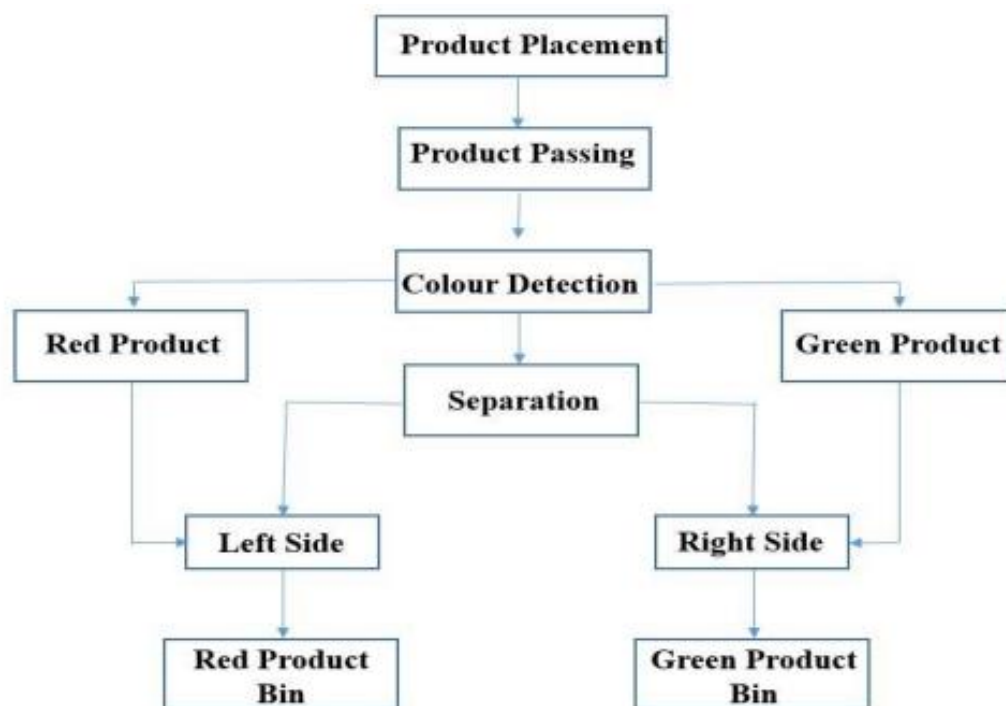
SCOPE

Sorting is an essential part wherever there are different products manufactured, weather it's food or any other industry. Color sorting is one of the important factors which we are doing. This project is of huge importance in small scale industries, and it can be considered as a working model for large scale industries.

Sorting process is necessary, and tying it with the conveyor system, makes it more efficient. Addition of such important process in the conveyor system, increases its importance in the industry.

METHODOLOGY AND PROCESS OF THE PROJECT

The DC motor was run at the 6Volt power supply and the belt in the conveyor started rotating. The program was set to regulate the speed of belt rotation and the speed was regulated to keep moving it slow at 70-80 rpm so that the product in the belt pass slowly and sensed in the color sensor accurately. The green products bin and the red product bin is placed respectively on the left side and right side of the divider separator. The flow chart of working procedure of the system is shown in following Figure:



When the Green colored product is placed on the conveyor, the belt drags it with its rotating movement to the Color sensor. The green Color of the product is sensed by the sensor and according to the program, the divider with servo motor make an alignment way to pass the product to the desired green products bin. Normally the servo divider separator is kept 90 degrees at neutral position whereas that servo motor can rotate 180 degrees. So there remains a chance of rotating the divider 90 degrees on both left and right side.

When the product is detected green on the color sensor, the divider automatically rotates 60 degrees right from the neutral position. At the time when the green product leaves the color sensor and come close in the range of divider, the divider automatically rotates 35 degrees to the left which drive the green product to the

Green product bin with a little slide force. On the verge of red product passing, the divider makes alignment way to pass the product to the desired red product bin.

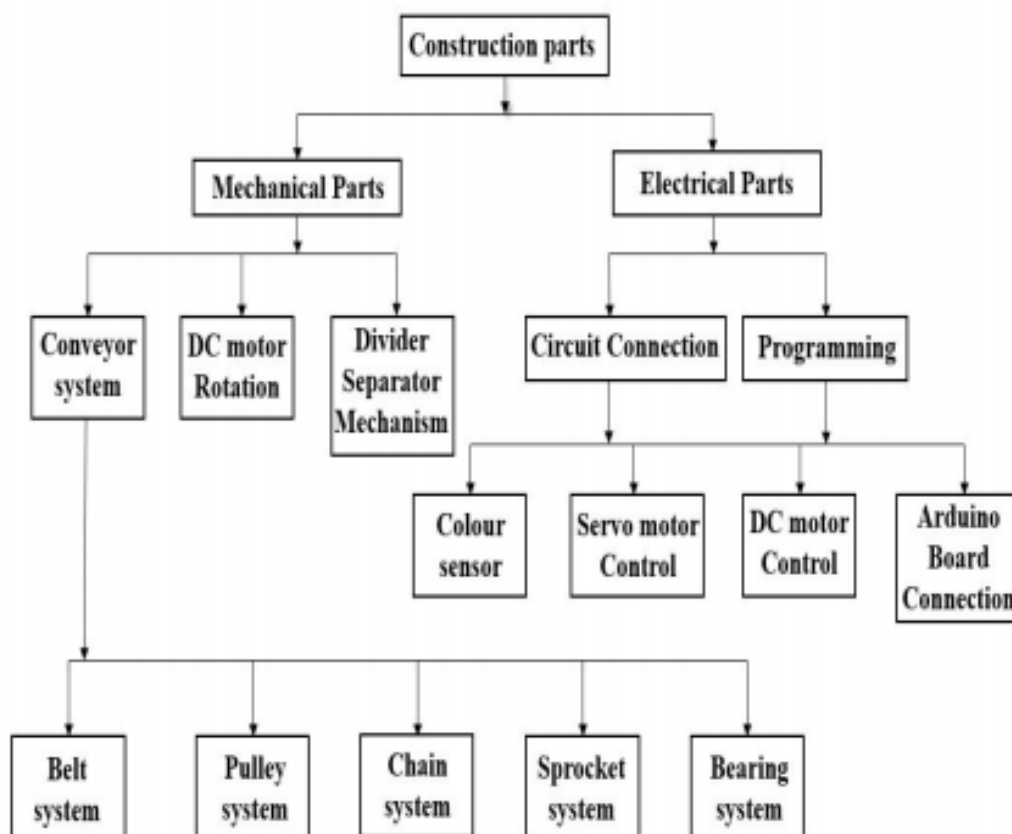
When the product is detected red on the color sensor, the divider automatically rotates 60 degrees left from the neutral position. At the time when the red product leaves the color sensor and come close in the range of divider, the divider automatically rotates 35 degrees to the right which drive the red product to the red product bin with a little slide force. Every time after the divider separator rotates 35 degrees to drive the product with slide force to the pre-determined bin, it returns to its neutral position so that it prepares for the next product to separate.

In this system of product separating, there's an advantage of safely and efficiently passing of soft and fragile product and separating them without any rejectable trace or spot. Here, the mechanism of the separating system to drive the product with small slide force is very much efficient to separate product safely rather than a thrust force mechanism system. In thrust force mechanism system, products are separated with thrust force to the destined places and this force of this system may cause harm of creating rejectable trace or spot on the soft and fragile products like cakes, sweets, butter foods etc. But in this system of slide force mechanism, the failure of soft and fragile product separating is drastically reduced and safely separation is ensured.

DESIGN

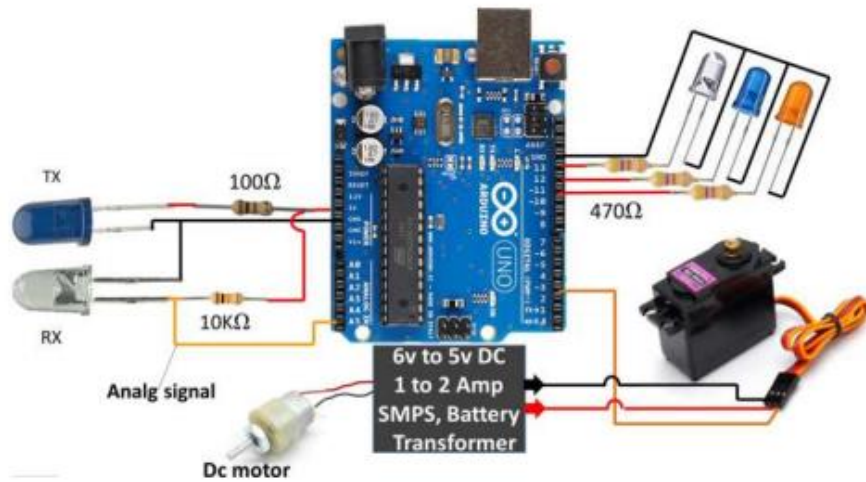
This project has 2 main parts which work in co-ordination with each other, it is the mechanical system of the conveyor and the electrical part, which works on programing, and does the main work of identification of colors and giving command to the servo motor to sort out the particular product.

The flowchart is shown below:

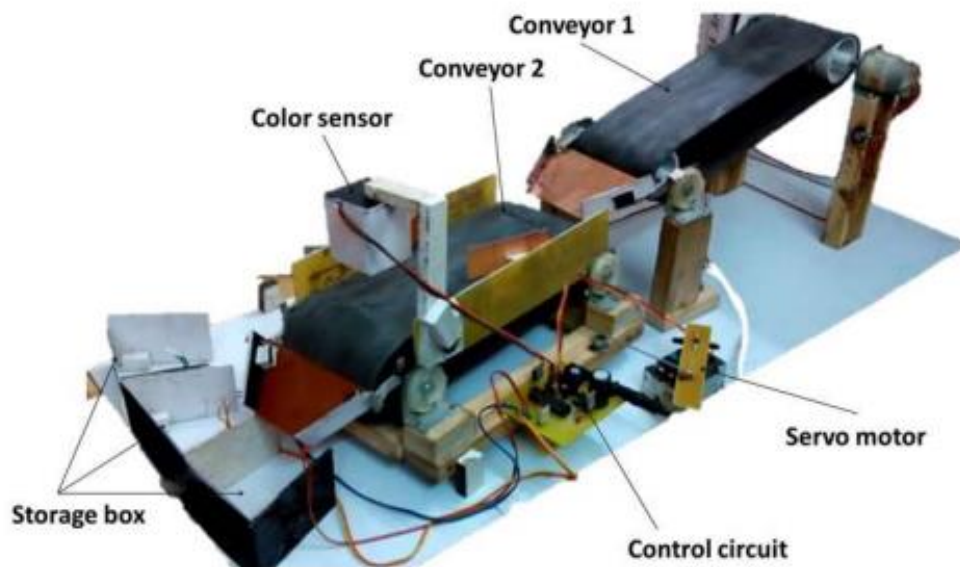


The programming on the Arduino is done using the software based on Arduino. For our project we are keeping the limit of just 2 colors for identification, if required more then 2 colors can also be used.

The circuit diagram of the electrical assembly with Arduino, sensors and motors is given below:



Final Assembly with the controlling system will look like this:
(efforts will be made to improve the design further)



LIST OF MATERIALS AND BUDGET OF THE PROJECT

Component	Cost
Arduino UNO	448
DC Motors	115
Conveyor Belt	140
Color Sensor	400
PCB Board	40
Servo Motor	300
14 V Batteries	50
Wires	15 to 30
Total	Rs. 1523

Hence, it is Cost effective

TESTING PROCESSES

Testing the project is quite simple process. Program the color sensor with two different colors and then start the system.

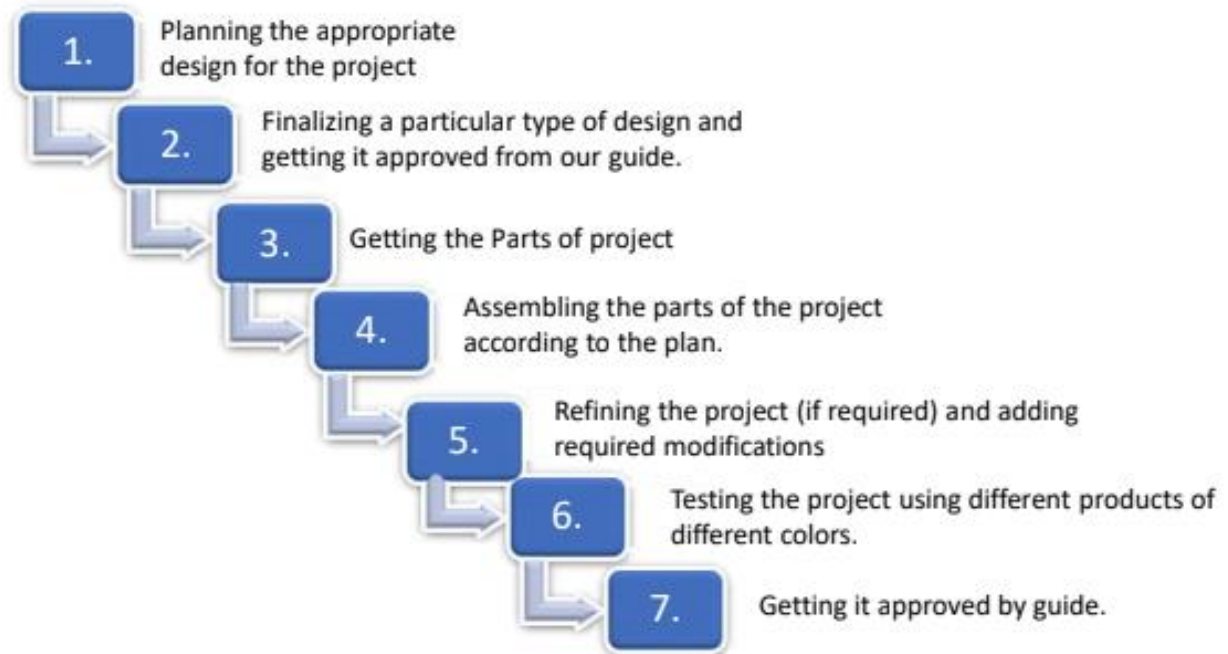
At first place one colored product (ex. Red) on the conveyor belt and see if the sensor is identifying it properly, and also if it's sorted out in the bin associated for it. Keep the speed of the belt at 70 rpm which is ideal speed for the project. Test the project multiple times by increasing and decreasing the speed of the motor in the range of 70 to 90 rpm. At first stage do this with just one colored product.

In the second stage, keep 2 products of different colors on the conveyor belt, (ex. Red and green), and then start the system at an ideal speed of 70 rpm. Here there will be a chance of causing error, so reprogram the color sensor for identification and then restart the system.

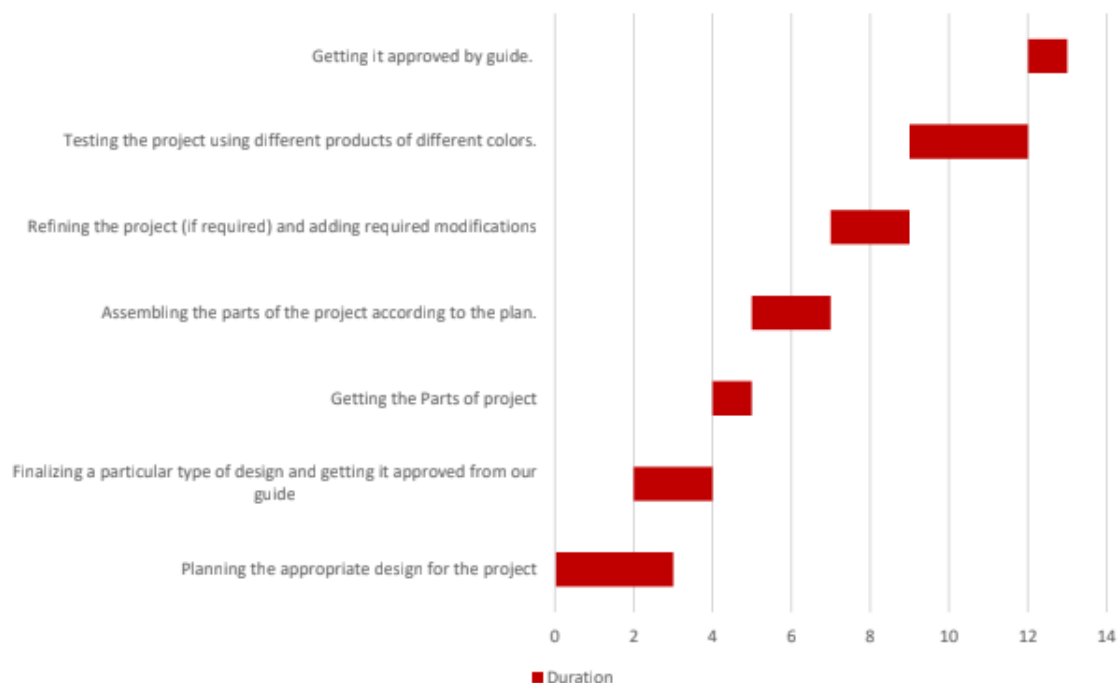
Increase or decrease the speed of the belt in the range 70 to 90 rpm. After testing the project multiple times, the color sensor will be programmed properly to identify the colors assigned, and will work efficiently.

TIME MANAGEMENT IN TERMS OF CPM AND GANTT CHART

CPM CHART:



GANTT CHART:



RESULTS

After testing the project, we finally get the proper working Conveyor system with color-based sorting process.

This project has wide range of applications in the food industries, small scale industries, where sorting is mostly done manually, this project will decrease the chances of the errors caused by manual sorting, and is also very reliable and cost effective.