

# COLOUR SENSOR BASED OBJECT SORTING ROBOT

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**Abstract** - The Project deals with an automatic material handling system. It coordinates the movement of robotic arm pick the items moving on the conveyor belts. It aims in organizing the coloured objects which are approaching on the conveyor by picking and placing the objects in its separate located place. There by reducing the tedious work done by human, accomplishing accuracy and rapidity in the work. The project includes colour sensors that senses the items color and lead the signal to the controller. The microcontroller guides signal to the motor driving circuit which drives the different motors of the robotic arm to grasp the object and place it in the correct location. Depending upon the colour sensed the robotic arm go's to the correct location to releases the object and comes back to the normal potion.

## 1. INTRODUCTION

### 1.1 OVERVIEW

Robot is computer-generated machine-driven agent. It is typically a electro-mechanical engine in which it is directed by the workstation or microelectronic software design, therefore capable of doing jobs on it's individual. Alternative collective characteristics is that by it's presence of actions, the robot frequently delivers a logic that it has determined of action of it's own. Though the presence and abilities of robot is massively varies, featured segments of all robots are automatic and those portable arrangements are in some form of under control. This director the robot to three separate functions called processing, action, and phase-perception. In public the attached sensor on the robot are preceptors, the onboard microcontroller or processors are the main units for processing and action is performed by using motor or additional mechanical elements.

In this i present a new project called a object sorting robot by recognizing the different colors of the object, this robot is helpful in collecting the object that are on the moving conveyer place and distributes those objects in correct location with different color. Many manufacturing workings areas are dangerous for persons to do his job therefore using of this robot are to reduce the risky work, time consumption and labor limitation. It is built by using the simple electronics devices like microcontroller for processing, DC motors for actions and color sensor for recognizing different colored objects.

### 1.2 PROBLEM STATEMENT

Based on a survey conducted in a helmet manufacturing company, there was a problem regarding the count of the total manufactured products and also, there were various assembly lines for every different colored helmet. The main idea was to provide a single conveyor for all the different colored products which would decrease the work space and labor cost but also provides the basic function of segregating different colored objects into its respective boxes. Also, the accurate count of the manufactured products could be centralized using wireless communication.

In a food packaging industry huge amount of time and labor was invested in segregating raw and ripened tomatoes. An object sorting robot would decrease the time, work space and labor cost while providing the basic function.

To decrease human works in operating the mechanical machines, different functionality robotic arms are established. Different functionality arms that are used in robotics are designed and developed to handle the jobs that are repeated. Different considerations are taken care to design the automation system. To design a high strength mechanical structure, these are the important parameters are to be consider and those are load bearing capacity, optimum weight, degree of rotation and speed of movement. In the form of designing an electronics system the specification of the used electronics devices are to be considered.

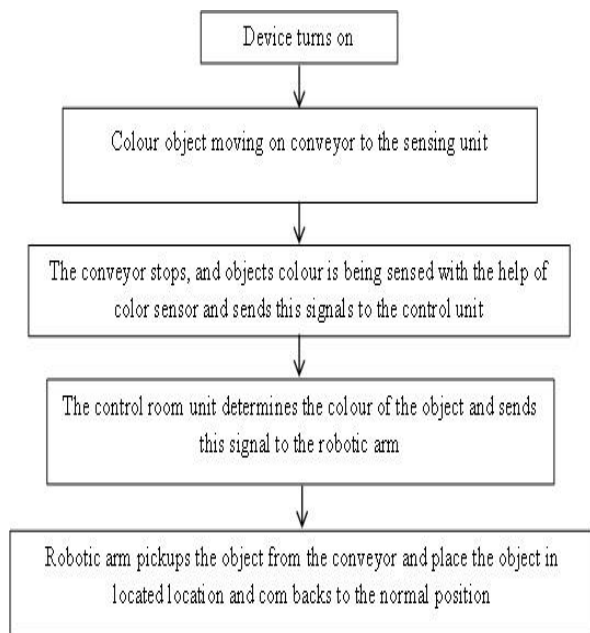
### 1.3 OBJECTIVES

- To make the process of sorting the material, this pick and place robot is being designed.
- In some of industries use man power to transfer the material form one place to other by repeating this for a period of time it will cause injuries to an operator.
- The use of this robot make the work simple for the operator, and no longer to bend and lifts up the materials, this reduce the cause of injuries to the operator and increasing the work efficiency.

### 1.4 METHODOLOGY

In this project, it used a simple method for sorting the materials of a different coloured objects, it is sensing the colour of the object and sort out the different coloured objects. With the help of a robotic

arm that is controlled by a controller unit is pic and place the same coloured object in the prescribed area.



Flow chart 1.1: Methodology

These are the different unit in the design of the product those units will work with the co-ordination of each other's in a particular time of intervals for the correct operation for the efficient process, and those are listed below.

**Control unit:** This is the main unit in the device it is capable of controlling the all other units.it will accept the signal from the input units such as sensor unit and capable of analyzing the signals from the input unit and delivers the signals to the outputs units such as the conveyor unit and robotic arm unit. All other units are works depending upon the direction given by the control unit.

**Conveyor unit:** The main job of this unit is to move the object form other place to sensor unit, when the object comes to the sensor unit the conveyor has to stop with the help of sensor unit.

**Sensor unit:** The purpose this unit is to informs the arriving of the object on the conveyor with the help of IR sensor and determines the colour of the object with the help of the color sensor and send these signals to the control unit for further operation.

**Robotic arm unit:** This unit has to work according to the direction given by the control unit for the picking and placing of the object from the conveyor unit to the other place which are located for the different colors.

## 2. DESIGN

In the process of designing the module for our requirements, first list out our requirements and for our requirements chose the efficient components for our requirement to be fulfilled. Those components should be connected together in a different way to work accordingly to our method. The connection between all those components in a systematic manner is called block diagram. And the block diagram of our design is shown below

### 2.1 BLOCK DIAGRAM

In the working process it has two different area of work one is for working with the coloured objects and another is for controlling the first area. And those are

#### 2.1.1 ROBOTIC AREA

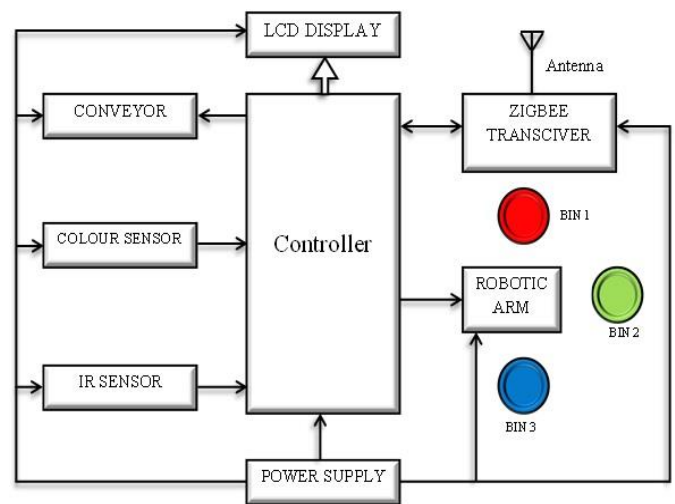


Fig 2.1: Block diagram of the robotic area.

The conveyor motors receives the power form the power supply. The one pulley conveyor belt, with a circular loop of materials on the conveyor belt that rotates about them. Forward movement of the belt brings the materials nears the sensor unit, when materials sensed by the sensors the conveyor belts stops for the identification of the color of the material with the help of the color sensor, then the signal of the particular material color is fed to the control unit for further operation, then the control unit send the signal to the robotic arm that picks the material and place the material in the prescribed area, after placing the material the arm of the robot is comeback to the normal place and waiting for the next material to arrive. Then the controllor start the conveyor to bring the next material to the sensor unit and the process continuous as explained in above in this page.

### 2.1.2 CONTROL ROOM AREA

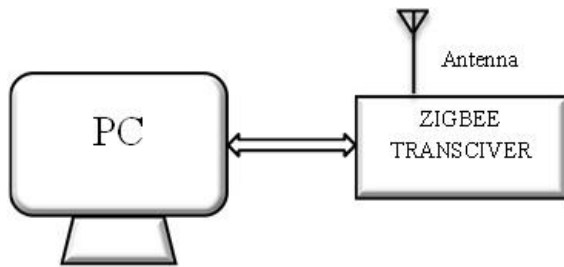


Fig 2.2: Block diagram of the control room unit.

This block is the main block for working out or controlling the operation of the robotic area and this is operated by a known user. It maintains record of the objects in a systematic manner for our observation and for future use.

### 2.1.3 WORKING PRINCIPLE

After material production, Materials will be kept on conveyer, that conveyer will bring the materials into the packing area. In packing area IR sensor is used to detecting material arrival, conveyer will stop when material arrives at the packing area and the color sensor is used at packing area to sort out the materials based on the color of the material. After identification of the color of the material, the same coloured object is placed in the prescribed bins, and those bins are kept at packing junction. Here the picking and placing of the material is done using the robotic arm.

The admin can change the Bin configuration from central PC using zigbee technology. If admin needs material count, he can take the counts from central system and controls the action of the whole system in the central station.

## 3. RESULTS AND CONCLUSION

### 3.1 RESULTS

This project is working automatically with the commands that are receiving from the control units for the operations like,

Commands	Functions
1	Conveyor ON
2	Conveyor OFF
3	Gripper closing alignment
4	Gripper opening alignment
5	Stopping gripper alignment
6	Arm position check-A
7	Arm position check-B
8	Arm position check-C
9	Counting information
a	Mode-01
b	Mode-02
c	Mode-03

Table 3.1: Commands used in the projects

These are the commands used for the initial setups for the project to work.

And there are the 3 operational modes

- Mode-01**
- Mode-02**
- Mode-03**

The mode tells the controllers to place the different color objects in the prescribed place, and the place location information is done by selecting the any one of these 3 modes.

In **Mode-01**

Color	Place with respect to arm
R	<i>LEFT</i>
G	<i>RIGHT</i>
B	<i>BACK</i>

Table 3.2: Mode-01 information

In **Mode-02**

Color	Place with respect to arm
R	<i>LEFT</i>
B	<i>RIGHT</i>
G	<i>BACK</i>

Table 3.3: Mode-01 information

In **Mode-03**

Color	Place with respect to arm
G	<i>LEFT</i>
B	<i>RIGHT</i>
R	<i>BACK</i>

Table 3.4: Mode-01 information

The design of the system tells the robotic arm to rotate in the 3 different angles.

By considering, the initial position of the robotic arm.

<b>90° Clockwise direction</b>
<b>90° Anticlockwise direction</b>
<b>180° Anticlockwise direction</b>

Table 3.5: Arm rotational directions



Fig 3.1: Project module

### 3.2 CONCLUSION

This project has been effectively designed to handle the required task. It can identify the specific color of the object and grab it and place it in a required area as the user wants with the help of RGB color sensor by sensing the color of the object.

The two main tasks performed by the sensing section.

- Detection of objects.
- Recognition of color.

This system is fully controlled by the control unit and capable of picking objects and places it to the respective area. This cost effective device was designed by using simple concept to achieve the constant and reliable tasks without the error from humans. This sorting device is very much

useful in production areas and different types of household activities.

Thus the robot with pick and place automation with color detection and distinction property is achieved successfully. The system could be used in industries for picking and placing objects efficiently and also for surveillance. The interfacing of all the components on a single board, the system could be made compact reducing the size and making it more compact.

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