

## Mechanized Robotic Arm for Object Sorting Based on Colour Sensing

**A.Venkatesham**

M.Tech (Advanced Manufacturing Systems)  
Ellenki College of Engineering and Technology,  
JNTU, Hyderabad, Telangana, India.

**Sri. G.Gopi Nath**

Associate Professor,  
Ellenki College of Engineering and Technology,  
JNTU, Hyderabad, Telangana, India.

### ABSTRACT

*In this project it is proposed that to separate the objects from a set according to their colour. This can be useful to categorize the objects which move on a conveyer belt. The proposed method of categorization is based on colour of the object. In this project the system categorize objects of two different colors (black & white). The project aim is to create an autonomous robot which can identify and separate the objects when placed on the conveyor belt based on the colour sensing and then sort them by relocating them to a specific location.*

*The detection of the particular colour is done through the optical sensors. The robotic arm is controlled by a microcontroller based system. It will be using a electromechanical robotic picking arm which uses DC motors to pick the particular object from the conveyor belt and place it according to the colour sensing and in addition the count of the objects will also be displayed. The gripper is designed using double sided worm gear or through screw and screw rod mechanism. The controller allows dynamic and faster control along with the electro mechanical devices for the movement. Liquid Crystal Display (LCD) makes the system user-friendly by displaying the count of the sorted objects. This is a mechatronics based project where controller is the heart of the circuit as it controls the entire operation of sensing the colour and sorting the objects.*

### LITERATURE REVIEW

To reduce the human efforts on a mechanical maneuvering in the present world different types of robot arm technologies are being developed. These arms are too costly and more complex due to the high

complexity and the high fabrication processes. In robot technology, Many of the robotic arms are well designed to handle the monotonous jobs and repeated works. In the design of these robotic arms are different parameters are need to be taken care. In electronic design the specification of the motors, drives, the sensors, and the control elements are to be considered. In the software side the re-configurability, user interface and implementation and compatibility are need to be considered.

Regarding the control software for the robotic arms, there are standard software's are available. The CAD drawing can be utilized to manipulate the movements of the robot's arm and a CAM software can convert the drawing into motion codes. Currently in this project work KEIL software is used to program the robotic arm for object sorting. Some of the Requirement of Electro-Mechanical Equipment's for the Project:

- Reduction Gear Motors, DC Motors, IR Sensors.
- Conveyor Belt, Limit Switches, PCB (Printed Circuit Board)
- Wheels (Preferably 100mm Dia)
- Grippers, and Microcontroller (ATMEL 89C52) etc.

### EXPERIMENTAL METHODOLOGY

This project experimentation is conducted by using KEIL software which is a complete software development environment for the 89C52 and 8051 family of microcontroller's architecture. The following program is used to run the experiment by using the software.

Keil Program:

RS BIT P2.6

```

EN    BIT P2.7
      DC1    BIT P2.0
      DC2    BIT P2.1
      DC3    BIT P2.2
      DC4    BIT P2.3
DC5    BIT P2.4
DC6    BIT P2.5
      LS1    BIT P1.0
      LS2    BIT P1.1
      MS     BIT P1.2
STRT   BIT P1.3
IR1    BIT P1.4
IR2    BIT P1.5
      LS     BIT P1.6

CNT5    data 31h
CNT3    DATA 32H
CNT2    DATA 33H
CNT5X   data 34h
CNT3X   DATA 35H
CNT2X   DATA 36H
      FLAG  BIT 00H

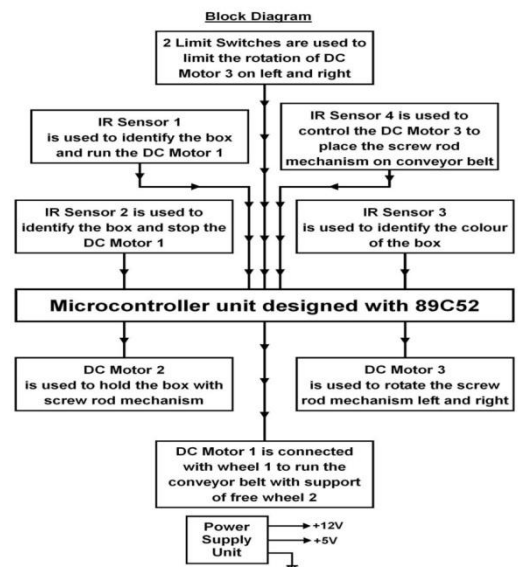
ORG 0000H
ljmp RESET
JB  STRT,$
RPT: SETB DC1
      CLR DC2
      LCALL DDELAY
MAIN: JB  IR1,NX1
      SETB FLAG
      JNB IR2,$
      SJMP ZX
NX1:  JNB IR2,MAIN
ZX:   LCALL DDELAY
      CLR DC1
      CLR DC2

      JB  FLAG,XX2
      SETB DC5
      CLR DC6
      LCALL DELAY2
      LCALL DELAY2X
  
```

```

CLR DC5
CLR DC6
AGN1: JNB  LS1,BLK
      SETB DC3
      CLR DC4
      SJMP AGN1
BLK:  CLR DC3
      CLR DC4
      CLR FLAG
      LCALL TOTAL1
      LCALL OPEN

AGN4: JNB  MS,BLK1
      SETB DC4
      CLR DC3
      SJMP AGN4
  
```



**Figure 3.1 Block Diagram of the robotic arm for object sorting.**

### RESULTS

This project work is successfully developed and a demo model working kit is prepared, verified and tested. For the demonstration purpose a prototype module is fabricated and constructed with a mini module and the results have found to be satisfactory. While designing and developing this prototype module in the project work, I have consulted few experts those who are having

knowledge in Mechatronics, and have taken suggestions from them and some industry experts and professionals working at different organizations helped me while fabricating project work.

In this project during demonstration it is verified and found that the robot's arm take the object based on its color and separate and place it to the specified location, that is if the block is white color, the robot's arm separates the white object to the right side, if the block is black color, then the robot's arm separates the black object to the left side. And in this project it is verified and demonstrated that the color of the objects has used only as black and white color. And if we keep the other color object (for example green color or yellow color) then the sensor will receive it as white color object because white color will cause to reflect the IR light from the emitter to back to the receiver, therefore the sensor will take it as a white color object.

Since this is a prototype module, the whole robot machine is fabricated and constructed with locally available hardware components, especially the mechanical components used in this project work are procured from the mechanical fabricators.

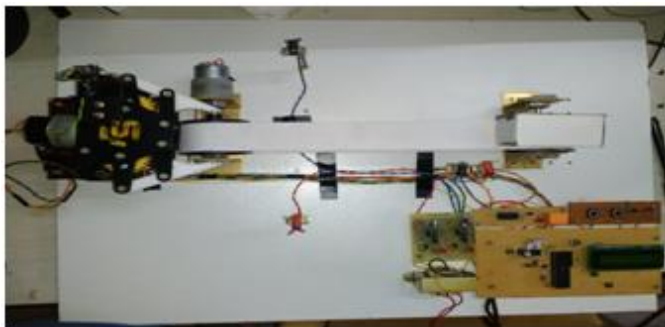


Figure 5.1 Experimental robotic arm for object sorting.

## CONCLUSION

In this project, this robot carries the sorting of the objects with the help of color sensors, the future progression and advancements can be done by enhancing the efficiency of the color sensors. This method has verified that it is highly beneficial for automated industries, especially in today's world. In this project the

sensor is the main component of the project which aides in distinguishing the objects or jobs based on colors, failure of which may result in the wrong material handling. Thus it will become the vital, that the sensors are having a very high sense of sensitivities character and the ability to categorize between the colored objects.

There are mainly two steps in this project in color sensing part, objects detection and the color recognition of the objects. This project is depicting the prototype of sorting the systems/objects/jobs which will be highly useful in industries like pharma industries, automobile industries, iron and steel industries and other Mechanical manufacturing, assembling industries, and material handling systems such as shopping malls, airports, museums etc.

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ISSN No: 2348-4845

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