

## **PICK AND PLACE ROBOT**

### **Task:**

We are assigning the task that over the floor there are 3 balls (Blue, Red & Green). The floor is marked with the grid which help Robot to move.

### **Specification of Robot:**

Our robot is autonomous which will perform all the task by its own once placed in perfect orientation. It will scan all the area through Pi-cam over it (by following grid pattern) and find Blue, Green & Red balls. When it finds the ball, it picks up the ball through a gripper and places it in the respective compartment of the bot.

### **Programming Language Used:**

Python  
C for Arduino IDE

### **Software Modules:**

Python for OpenCV for image processing.  
Arduino Code which controls all robot movements.  
Solid works for design of CAD  
Raspberry Pi OS

### **Hardware:**

Arduino  
Raspberry Pi  
H-bridge  
Power/Battery  
Picam  
Servo/stepper motors  
IR sensors  
Mecanum Wheels  
Connecting Wires

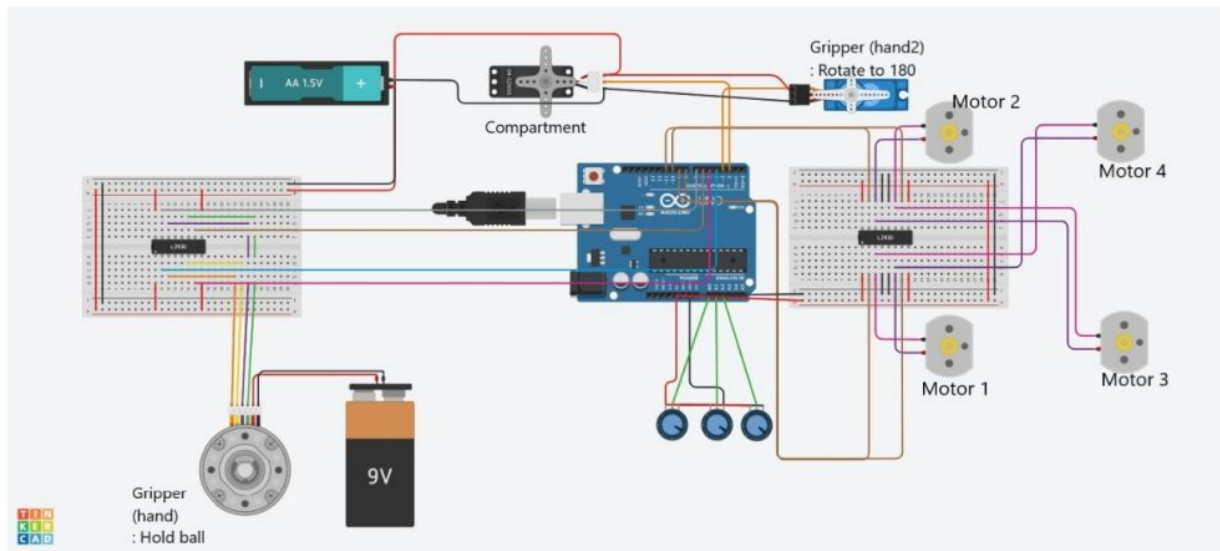
### **Functionalities Of Robot:**

1. Navigates over a fixed square grid.
2. The gripper can move in a horizontal direction as well as can rotate.
3. Can repeat the pick and place task repeatedly.
4. It will scan all the area through Pi-cam over it (by following grid pattern) and find Blue, Green & Red balls. When it finds the ball, it picks up the ball through a gripper and places it in the respective compartment.

### **Detailed Description of the bot:**

#### **Electrical Work:**

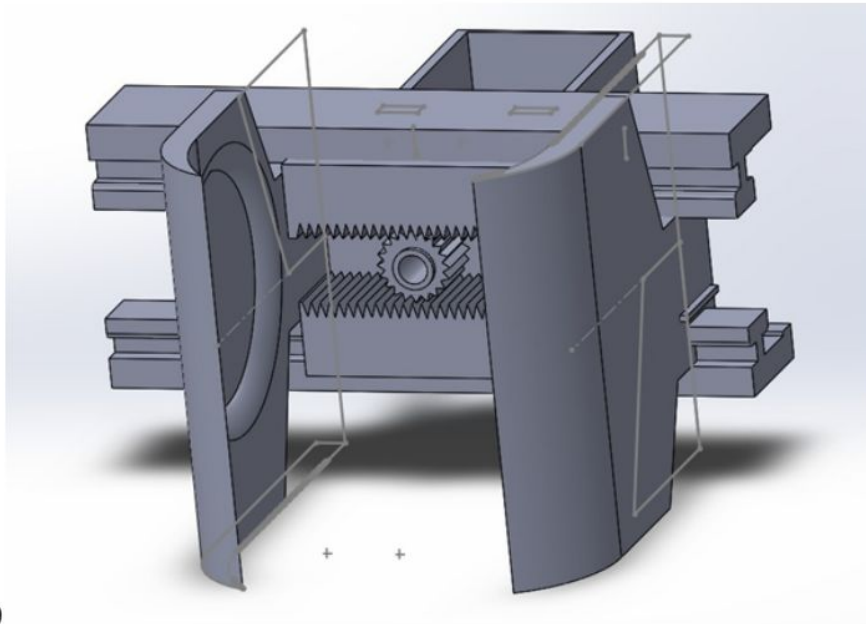
The pick and place robot is designed to run around a grid and pick balls placed in between the square grid. Image processing done using OpenCV code enables colour and shape detection. The robot has a picam installed which captures the image frames and applies the ball detection algorithm to detect the ball and also distinguishes it into different colours. Now the OpenCV code is linked to Arduino IDE using pyserial. The output integer value assigned to each colour from the OpenCV is sent to Arduino which gives signals to the motors to operate and reach the ball. H-Bridge establishes the connection between the Arduino board and the motors attached to each wheel. The Wheels used are mecanum wheels which allow omnidirectional movement without changing the orientation of the bot. The robot is made to follow the grid using three IR sensors. Using the grippers, the ball is picked and placed into the compartments formed in the bot itself. The round shaped compartment is connected to a stepper motor which allows rotational movement of the compartment.



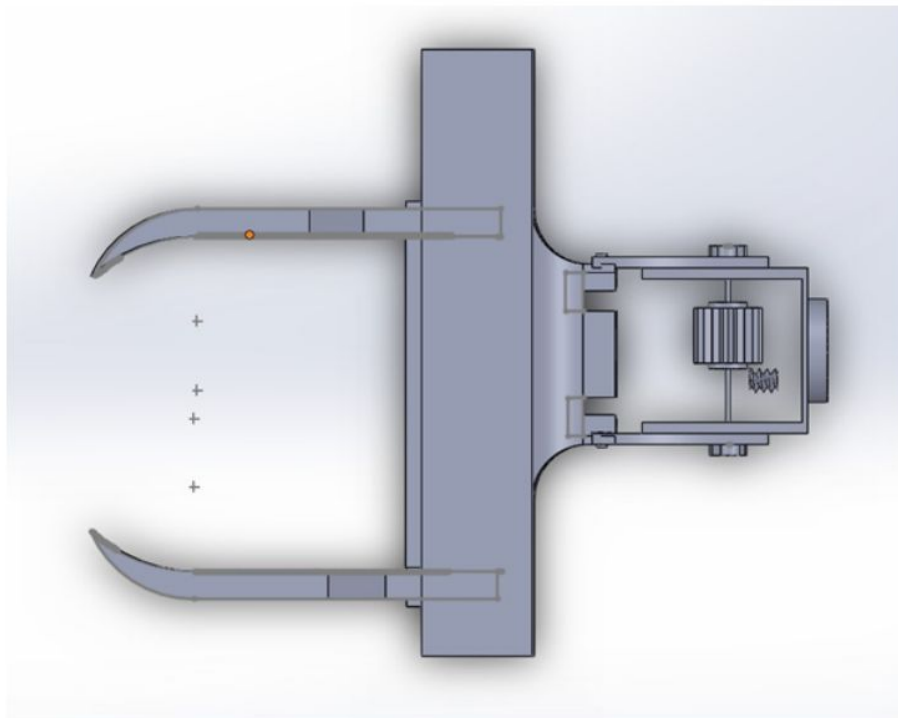
## Mechanical Work:

The base of our robot is  $15 \times 15 \text{ cm}^2$ .  
The different main parts used in it are:

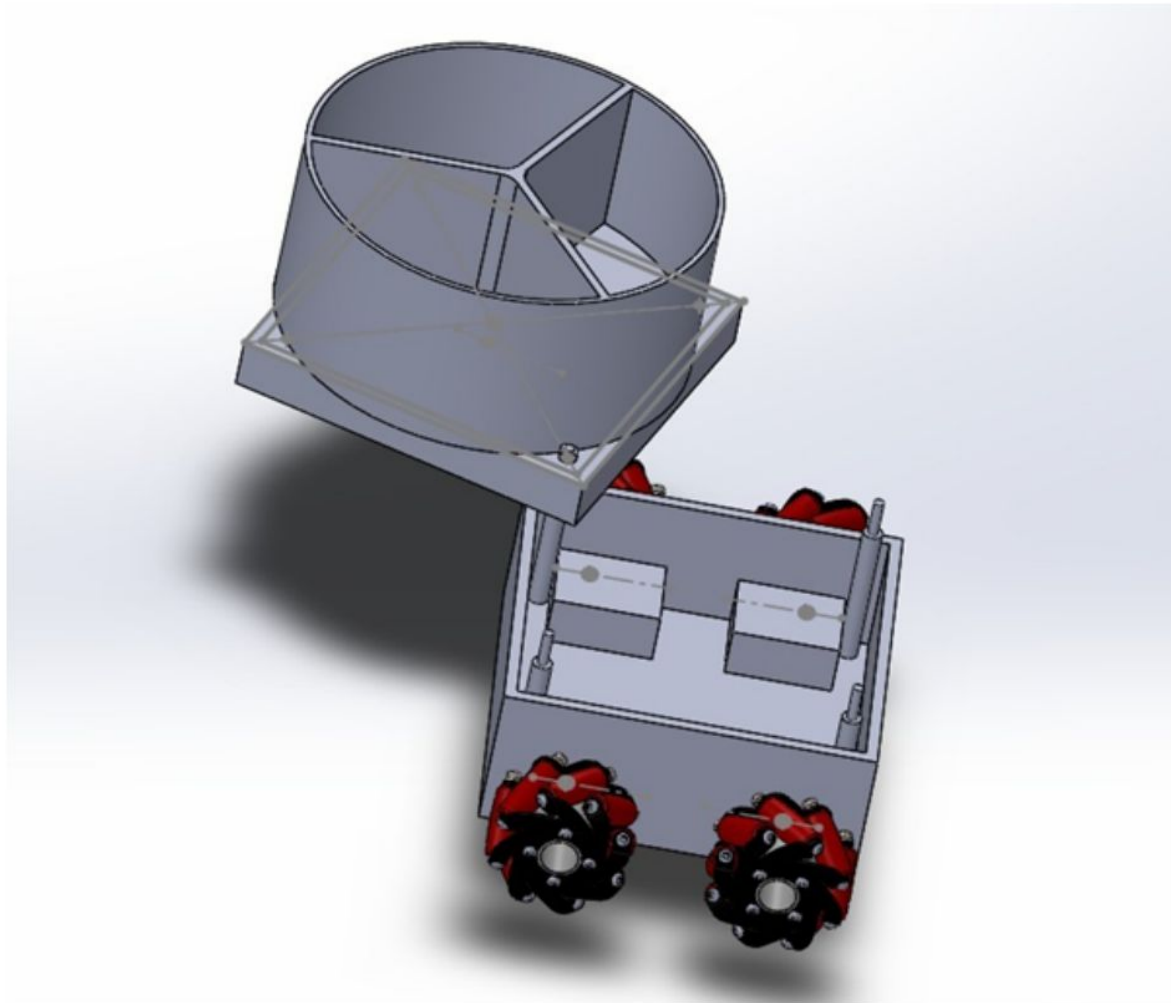
- Mecanum wheels
- Rack and pinion
- Jaws
- Cylindrical compartment
- Rippets...etc



Ko9



**GRIPPER'S MECHANISM** :- The gripper consists of two motor drivers. First one is to capture and release the ball , while the second one is for placing the ball into the compartment.  
About



**COMPARTMENT specs:**-- The compartment is cylindrical and having the equal space at an angle of 120 deg for the ball to fit into. The compartment is having a rotor at the bottom of the base which will get rotated after the ball get dropped into it. There is a disk consist of the small rings which is used to reduce the friction sharply. Inside the base there is space for other stuffs to fit into like battery , Arduino , motors driver...etc

