

# Development of Road Cleaning and Scrap Collecting Robotic Vehicle

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**ABSTRACT:** *This paper shows the advancement of Road Cleaning and Scrap Collecting Robotic Vehicle and its different usages. As neatness of our condition has its own ideal conditions which makes it a basic topic of research nowadays as it goes under Swacchh Bharat Abhiyan, an activity taken by the legislature of India additionally it favours green collecting structures and we pointed conveying cleaner streets by utilizing least endeavours. This paper shows both the details of the components used to construct the vehicle and the working of the vehicle as whole too. In the coming days these vehicles will be utilized to diminish contamination and improve tidiness in our area.*

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## INTRODUCTION

As indicated by the examinations from different research papers, it is seen that the flotsam and jetsam as residue particles, plastic transfers, wet waste, natural waste, metal jars are cleaned successfully by the cleaning instrument present in the vehicle containing sweepers, suction siphon, scrap authority, electromagnet and so on yet at the same time It requires manual exertion by the labourers to isolate the gathered rubbish and arrange it into dump yard for reusing. So here we come up with the overall solution from collection of waste to segregation as well as the disposal at the dump yard.



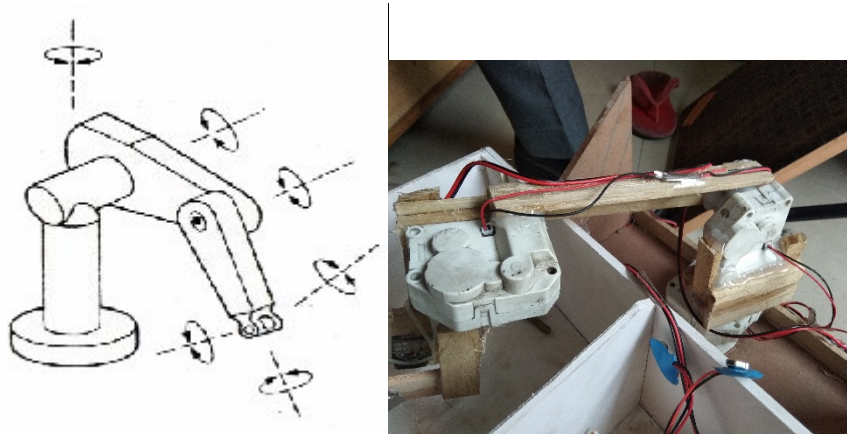
**FigA: The Complete Working Model of the Robotic Vehicle**

In this pursuit we employ different components; the major components employed in our robotic vehicle are mentioned below (Fig A):

1. Robotic Arm
2. Electromagnet
3. Vacuum Generator
4. DC Gear Motors(12V 300rpm)
5. Spherical Ball
6. Wheels
7. Step Down Transformer
8. Control Panel
9. Segregation Tanks

## **WORKING PRINCIPLE OF DIFFERENT COMPONENTS**

### **1. Robotic Arm**



**Fig1: Motions of robotic arm    Fig2: Robotic Arm**

This segment can be adequately used to acquire the ideal outcomes. A model robot which can turn, pick a thing, lower and raise its arm, with the assistance of control panel mounted on the back of the arm (Fig1). The arm development board is welded and it uses the required system for the correct working of the control panel. This board has been interfaced to the DC gear motor with the objective that the arm like body can be controlled from the grip at the bottom of the structure (mechanical arm) (Fig2).

## 2. Electromagnet



**Fig 3: Electromagnet attached at jaws**

An electric flow can deliver an attractive field in a plane opposite to the course of flow stream. The electromagnet utilizes this rule. Basically, an electromagnet is a magnet which works on power. Regularly, the atoms in the nail are situated in arbitrary ways and individual attractive fields counterbalance one another. Affected by electric flow, these particles are reoriented to begin pointing a similar way. All these individual attractive fields together make a solid attractive field. As the present stream builds, this level of

reorientation likewise increments, bringing about a more grounded attractive field. When every one of the particles are reoriented consummately a similar way, expanding current stream won't influence the attractive field delivered. Now, the magnet is said to be soaked.

Here the electromagnet is fundamentally used to help in isolation of metallic waste from non-metallic waste (Fig 3).

### 3 Vacuum Generator



**Fig4: Suction fan generating vacuum**

Materials stream beginning with one zone then onto the following when a weight qualification is made between two territories. This marvel is the basic working rule of an ideal vacuum all the more spotless. Right when an outward fan turns it makes the air to stream by including its external dynamic imperativeness. This device suck the small dust particles due to the formation of vacuum which are deposited at the cylindrical container due to the centrifugal action in the vortex casing. Centrifugal action in the casing is achieved by the radial fan associated with a motor. The low weight air brought about by the air going into the vacuum cleaner draws up little articles which at that point get caught in packs, canisters or channels. Vacuum cleaners utilize low gaseous tension to enable us to get little particles of soil and residue.

Dimensions: 97\*97\*30mm

Voltage : DC 24V

Rated Current: 0.25A

Fan Type: Turbo blower fan

## 4 DC Gear Motors



**Fig5: DC gear motor**

Specifications	Value
RPM	300
Voltage	4V to 12V
Torque	23Kg-cm
Shaft Radius	4mm
Shaft Length	17.5mm
Gear Assembly	Spur

This heavy duty 300rpm motor is responsible for variety of robotic/kinematic structures. Its working is improvised with the help of gear box by reducing the torque transmitted by the motor. Driver shaft is maintained from the opposite sides with the help of metal type bushes. Motor operates effectively from 4 to 12V and gives astonishing speed of 300 RPM at 12V. Motor is of 8mm width, 17.5mm length driver shaft with required shape for stunning coupling.

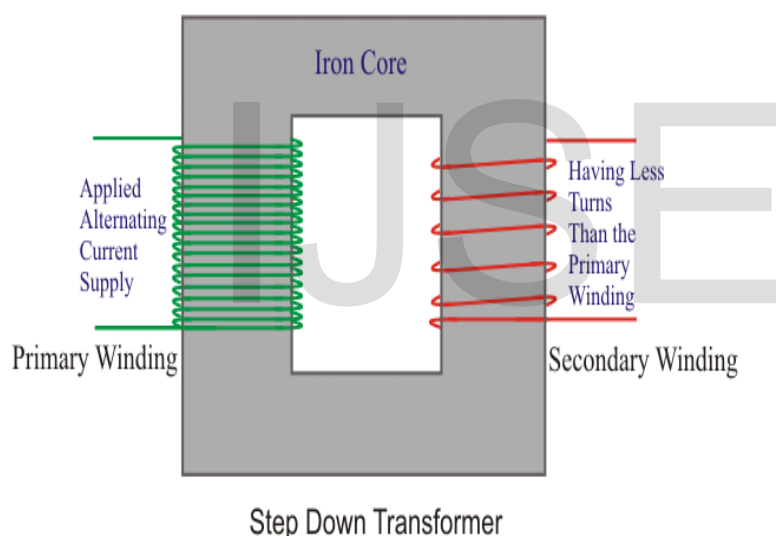
## 5 Spherical Ball

This vehicle is of 3-wheeler type in which round ball goes about as a cumbersome additional individual wheel of the vehicle which is used to offer assistance to the entire vehicle system. Its estimation is much more diminutive when stood out from the two distinct wheels which are driven by DC gear motor. The round Ball does not contains any motor as it is driven by the development of two more prominent wheels.



**Fig6: Spherical ball**

## 6 Step Down Transformer



**Fig7: Working Principle**

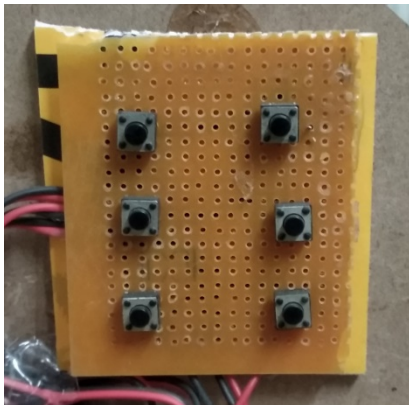


**Fig8: Step down transformer**

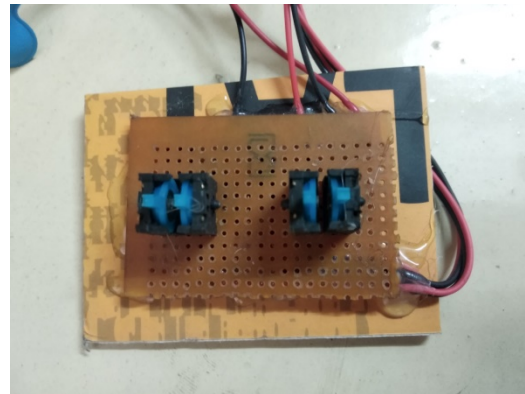
A step down transformer is used to convert the higher potential difference and low value of current from the primary circuit to the lower potential difference and high value of current sent to the secondary circuit. This type of transformer has variety of applications in various electrical and electronics appliances A phase down transformer is used to provide the low potential difference esteem that is reasonable for appliances providing. It again step down the room supply (220V) from primary circuit to a low potential difference on the secondary circuit so as to run the electronic appliances.

In this vehicle, it is utilized to venture down the voltage of room supply and convey it to suction siphon running at .25 amp and 25Volts.

## 7 Control Panel



**Fig9: Robotic Arm Control Panel**



**Fig 10: Vehicle Motion Control Panel**

Control Panel is a taking care of gadget which encourages us to assume the responsibility for the moving vehicle. In our vehicle two control boards are utilized , one is controlling the mechanical arm movements each conceivable way and the other board is utilized to control the movement of the vehicle .Hence along these lines by utilizing distinctive boards we can without much of a stretch control diverse movements of the vehicle for sparing time.

## 8 Segregation Tank

It is a kind of Garbage tank masterminded at the back of the vehicle, it is used to assemble the waste and after that orchestrate it into the landfills in like way. It contrasts from the common garbage tank as it incorporates "Detachment", which is described as the methodology of segment of waste dependent on their piece size (for example



**Fig11: Segregation Tanks**

Metallic and Non Metallic, minimal size particles and tremendous size particles) as to reduce the manual effort and time of the laborers.

In this vehicle, the isolation tank is separated into three chambers appeared in the figure underneath, one littler chamber at the back and the other two greater chamber at the front. The littler chamber is utilized to gather the littler residue particles with the assistance of suction siphon though, the other two chambers are used to accumulate the plastic compartments, sustenance drinks

squander, exchanges, metal holders, etc by the help of automated arm and electromagnet separately. Along these lines, metallic, non-metallic and little size waste is isolated effectively.

## VEHICLE ERGONOMICS

### Dimensions of the Vehicle

SNo	Name	Dimension(cms)
1	Length	60
2	Width	40
3	Height	30

### Dimensions of Segregation Tanks

#### 1 Dirt Segregation Tank

SNo	Name	Dimension(cms)
1	Length	8
2	Width	36
3	Height	12.5

#### 2. Plastic Segregation Tank

SNo	Name	Dimension(cms)
1	Length	19
2	Width	20
3	Height	12.5

#### 3. Metallic Segregation Tank

SNo	Name	Dimension(cms)
1	Length	19
2	Width	16
3	Height	12.5



## **Dimensions of Robotic Arm**

Length of Robotic Arm: 30cms

The maximum length of the vehicle when the arm is parallel to the longitudinal axis : 83cms(60+23)

The maximum height of the vehicle when the arm is parallel to the lateral axis : 50cms

## **Power Source to run the vehicle :**

### **A.) DC Power through Bateriaes**

All the DC gear motors works on the DC power, Hence the vehicle propell through the DC source itself. Two 9V batteries are employed to make the vehicle propell.

The Robotic Arm also works on the DC power . All the motions of the Arm are controlled through a control panel which eployes two 9V batteries.

### **B.) AC Power through Mains**

The AC Mains is used majorly to run the vacuum generator and the electromagnet.

## **CONCLUSION**

The reusing pickup work is physically requesting and it opens specialists to numerous word related perils. This undertaking is intended to satisfy the errand of gathering the refuse from specific places and afterward arrange it at a solitary spot from where the rubbish will at that point be taken for transfer or procedure of reusing To assemble a manual junk robot utilizing microcontroller which gathers the paper and plastic things physically and process it by isolating the attractive waste from the remaining debris. Also its vaccum cleaner expelled the residue particles from the street . So this decreased the prerequisite of manual leeway of plastic and different squanders.

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