Winbot Module Based Arm Structured Cleaning Robot

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Abstract—In India, The new campaign was started in the year 2014 with the name as "Clean India Mission". It has the main objective to clean the roads, streets, cities and smaller towns and local areas. This project improves the new concept of Automatic cleaning system. It consists of technological developments like the concept of mechanism with electronics based design. The objective of the WINBOT module is to re-construct and design of a robot. This module provides creative solutions to various problems, including construction with new design of a robot that can rotate on any surface.

Index Terms—Cleaning robot, Pollution control, Technological development, New design.

I. INTRODUCTION

According to Pollution prevention Act of 42 in US (1990), It focused public, industry and government, attention on lowering the pollution, through different kinds of changes in raw material, operation and production usages. The chances for reducing the sources are often not realized because of older regulations .The Source reduction is basic thing and it is more effective than pollution control or waste management. In the years late 1930s, After pulled up into the tunnel shaped entrance, the helping assistant guided the customer onto the correct track or conveyor path .The different type of systems with the customers need may help on and with an old methodology of "Send Car" button with the controller of tunnel .According to the act of EPA[1], The term waste includes materials that are contained with an equipment's or changes in technologies, or changes in procedure modifications, reconstruction or redevelopment of new change in products, change in use of raw materials production, and differs in households, maintenance services in industries. Pollution prevention act which also includes new legal practices that improved in efficiency for the usage of energy, water, or other natural resources, and to protect our resources by natural through protection and conservation. Even many countries implemented many pollution act to preserve the environment, hence the project provides with the eco-friendly solution with less manual labor and usage of automatic washing system [2-4].

In the modern days, the technology has been improved in which the car washing system was implemented in foreign countries on which the car is tracked to the conveyor path, it moves with soaping of the car at the initial stage and further air jet streaming of water is injected for cleaning, so it required manual cleaning to wipe the surface of the car [6-8].

A good car wash makes use of many different kinds of equipment to clean and clear the dust of the vehicle.

This module can overcome all the above parametric problems with some customized changes in car cleaning robotic idea and which can be installed in future generation automobile technology. However, almost all very expensive and heavy machinery is used in the past generations, therefore materials with requirements of small, light-weight car winbot (cleaning robot) are also growing in the vast field of car industries for cleaning automobile technology.

The block diagram of WINBOT is shown in Figure 1.

The advantages are provided for car cleaning bot in future concept car efficiently for the practical use:
1) It must be small size with no involvement of huge machines
2) Cleaning all the windows of car by automatic movement.
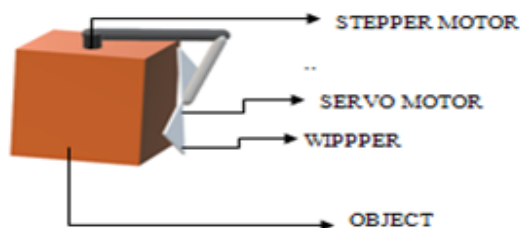3) Effective cleaning of all the windows of car.

Figure 1. Block Diagram of WINBOT

II. HARDWARE MODULE

The hardware module is designed for Automatic cleaning purposes for future development by using micro controller, motor drivers to make it simple and efficient.
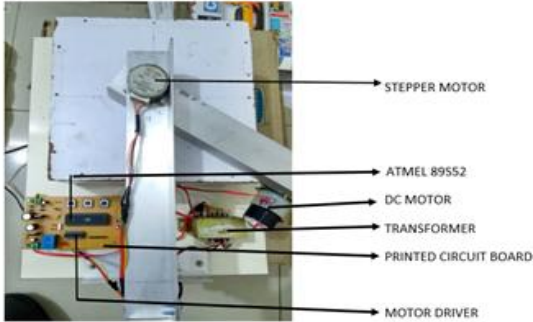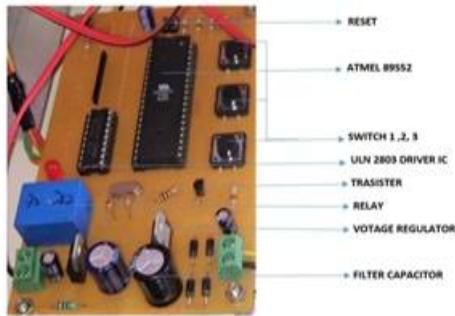

Figure 2. Hardware Module of WINBOT

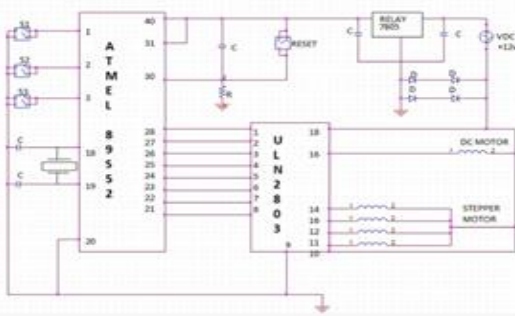Figure 3. Printed Circuit Board of WINBOT

Figure 4. Circuit Diagram of WINBOT

i.   *SPEED* – The WINBOT speed can be adjusted accordingly from low to High or vice – versa in general translational or rotational motions, the high level priority of the competition, quick coverage and effectiveness can be achieved.

ii. *COMPLEXITY* – Medium – Although surface translation is simpler, a mechanism is needed to position the cleaning part of the robot with the help of projected arm.

iii. *MECHANICAL SYSTEMS* -We use revolution mechanism which has locomotion mechanism and adhering surface. This report is made by review of previous researches [5]. This design made under focus on mechanism of the older versions of robotic cleaning. It could cross over the window edges or joint line by robo arm, With the multi windows like as an exist in locomotive cars alike as a necessary and an important application as shown in Figure 2&3

iv. *ROTATION PATH* - With the cleaning of all the plane, there are 2 different Kinds of travelling ways in Figure 1 were considered as shown .We can be adopt to a new method in Figure 1 because of cleaning affectivity and energy efficiency .The robot will rotate up in multi directions. i.e., the robot could continue to rotate either in left to right or right to left, wipe the window efficiently. Therefore it will be better on energy efficiency aspects. There are some restrictions regarding in dimensions as well as specifications as shown in Figure 5.

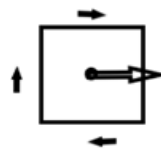**Anti-clock wise:**
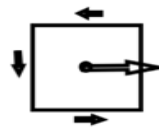
Clock wise:

Figure 5. Rotating part of WINBOT

This uses two motors named as Dc motor as well as servo motors are connected with Micro controller of program memory, with several hardware functions.

v   *POWER SUPPLY*- The power supply with 18 watts. .External power supply is required for charging the batteries, on to a scale that works within the diameter of the 20-30 centimeters. Analog input pins of the microcontroller. This allows the robot to rotate at low-battery conditions, where the latching delay across the servo -motor is activated.

vi *DC MOTORS* -These are operated by pulse-width modulator, to allow a full range of rotation control.

The feedback pulses from the optical encoders to stop the motor at such conditions. It is used because it is single pulse generator stepping motor as shown in Table 1.

Table 1. DC motor specifications

S.NO	NAME	SPECIFICATION
1.	Modal	17 pu-h502-5t
2.	Magnet	Ferrite
3.	Step angle	3.75
4.	Drive sequence	Bipolar
5.	Ratted current	0.8
6.	Winding resistance	5.5
7.	Holding torque	0.21
8.	Inductance	9.5 MH
9.	Rotor inertia	0.040
10.	Detent torque	0.023
11.	Weight	220 gms

vii. *Micro controller*-With the simple design of the controller, from lower level to higher accuracy was operated by Dc motor. The stepper -motor shaft is mounted with suction cup, and been controlled by a Micro controller that are coded in a specific sequence, precisely rotating it forward or backward with small steps.

viii. *Optical Encoders* -The optical encoders were provided cubical data to the robot, with decoded cubical output. The pulse signals are generated by using hardware timers of the Arduino UNO. This results that no processor time is requires tracking how far the robot has completed the rotation.

Table 2. Micro controller specifications

S.NO	NAME	SPECIFICATIONS
1.	Micro controller	AT mega 328
2.	Operating voltage	5v
3.	Input voltage	7-12v
4.	SRAM (ATmega 328)	02KB
5.	EEPROM (AT mega 328)	01KB
6.	Clock Speed	016 MHz
7.	Length	68.6 mm
8.	Width	53.4 mm
9.	Weight	25g

III. CLEANING ALGORITHM

i. *LOCOMOTIVE MECHANISM OF WINBOT*- This robot rotates with the help of Dc motor by two dimensional axis movement with the distance of an object to re-define the edges accordance with rotation of the stepper and servo motor with suction cup surface and which it is fixed with base of suction cup. For example, The frictions between the base material and the wiper can transmits the normal rotation of the torque, and in low friction period it can helps to achieve for the movement of the robot with hold of body with strong surface[9-10]. We had chosen POLYTETRA - FLUOROETHYLENE (PTFE) for suction cup materials of the surface for stronger grip.

ii. *CLEANING MECHANISM* - Cleaning mechanism is important mechanism to clean even at the edges and corners of window. Figure 6 shows motion of winbot changing its locomotive direction at respective corners. Since the winbot change its direction with circular motion, it reaches out an end corner of the object. It uses cleaning material like foam with shaped as infinity to make more effective cleaning at the edges.
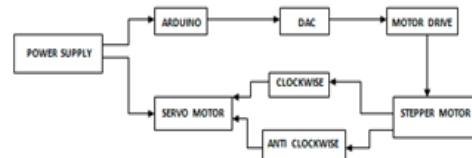

Figure 6. Design metallurgy of WINBOT

The flow chart for the operation is explained with algorithm methodology. It is shown in Figure 7. Flow chart of Operation.
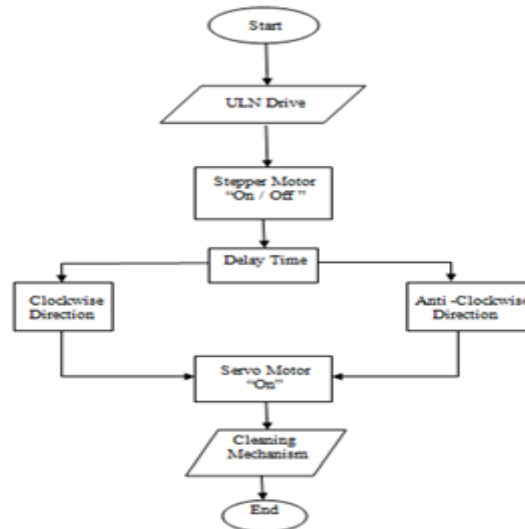

Figure 7. Flow chart of operation of WINBOT

IV. RESULT & DISCUSSION

Here Dc motor will be fixed with suction cup which remains as the base to the WINBOT. On which the micro controller sends specific set of instructions connected to the motor, when it is rotated at particular time delay intervals the motor is fixed to an arm which makes the servo motor is present in the surface to wipe up surface in it. The servo motor is the cleaning part of the WINBOT which attached with foam, as it keeps on rotating as soon as the Dc motor stops its movement. The rotation of Dc motor and servo motor are made automatic with Arduino code. The flow chart and hardware results are shown in Figure 8.
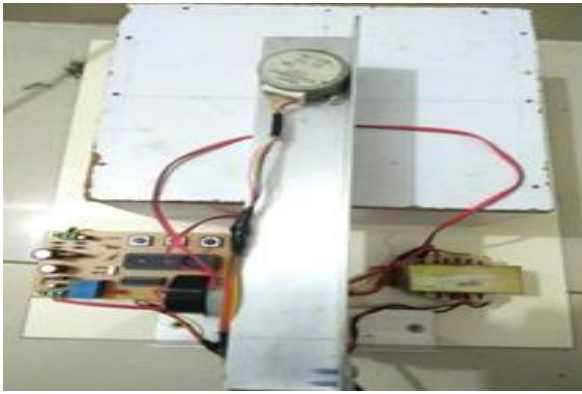

Figure 8. Hardware output result of WINBOT

V. CONCLUSION & FUTURE SCOPE

Use of Automatic systems are increasing day to day, as the technology increases. The same technological development can be used in a way advancing consist of renewable with electric vehicle sectors in micro-gird standards [13]. The dependency of humans on automatic machines increases which makes the work efficient and effort less. WINBOT is one of the most compact and much more useful robots used to clean all sides of the window under the dimension of cube. As very low power is required for working of this cleaning robot, it is of more reliable and the whole work of cleaning the window is automatically cleaned by movement of the arm.

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