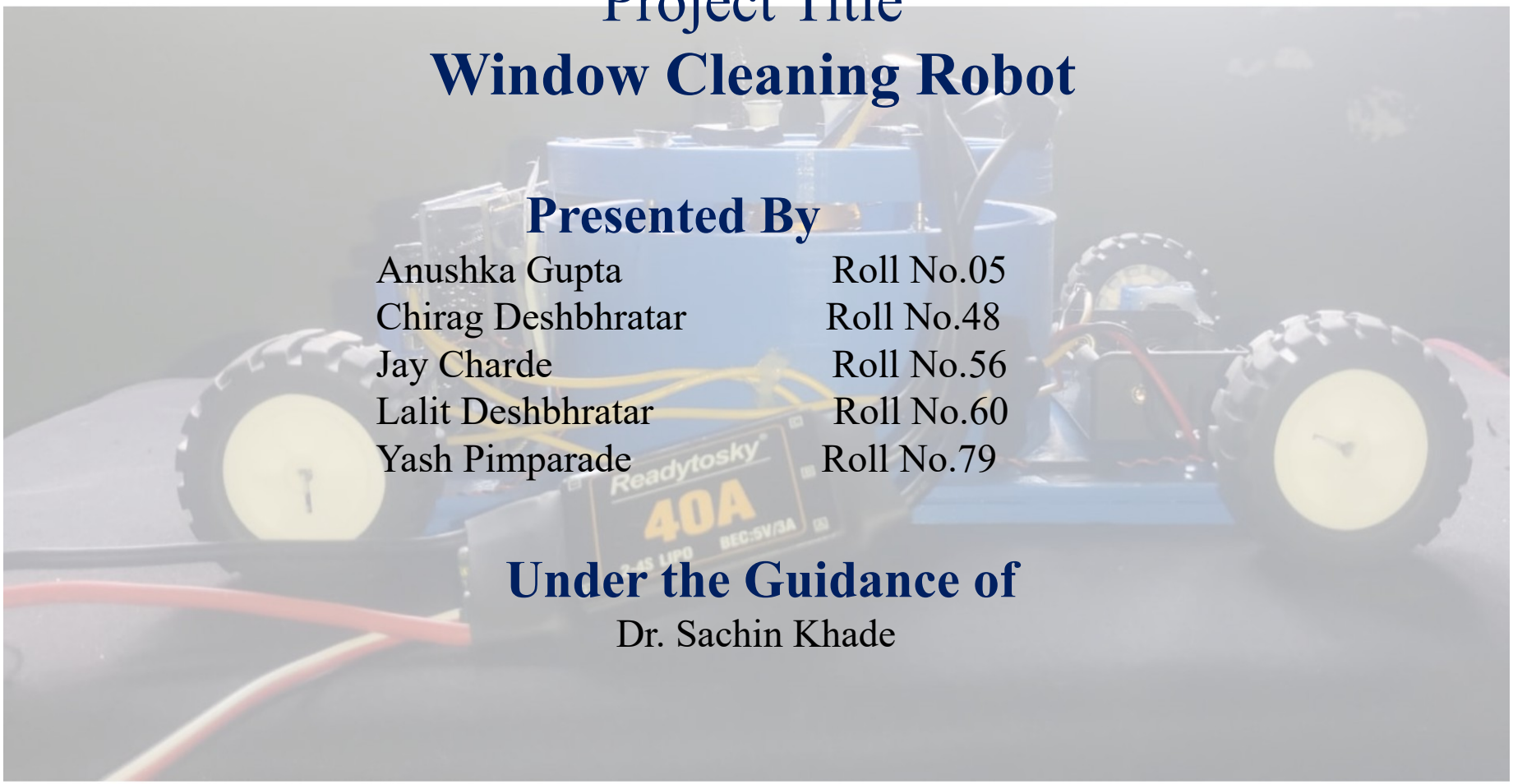
Yeshwantrao Chavan College of Engineering

Department of Electronics & Telecommunication Engineering

Project Title

Window Cleaning Robot



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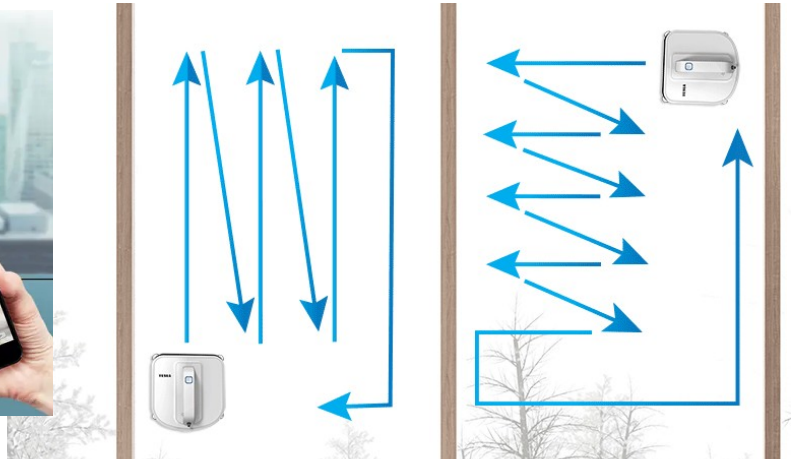
Smart Window Cleaning Robot



Autonomous robotic device designed to clean glass surfaces efficiently and safely

Problem Statement:

Stunning and modern houses nowadays have been constructed with increasing number of curtain window glass walls and corresponds to the requirement of its maintenance, repair and care from dust and pollution. This window produces a lot of difficulties such as the window's height and the exposure to the risk of hurt or injury during the cleaning process.

Proposed solution:

A window cleaning robot by using ESP32 as microcontroller is developed with BLDC motor, N20 motor, motor driver . High speed BLDC motor is used to attach the window robot vertically on the surface of glass wall whereas high torque N20 motor will move the robot accordingly and thus it will clean the glasses using cleaning mop with wet/dry functionalities.

Literature Survey:

Sr No	Title	Company/ Publication	Specifications
1	HUTT THINK (W66 advance window cleaning robot)	HUTT	**Weight :** 3.25Kg **Tank capacity :** 150ml **Climbing Mechanism :** Suction **Motors used:** BLDC MOTOR(2600p) **Sensor:** Freescale pressure sensor, Gyro chip, laser detection sensor, human voice broadcast.
2	Gecko Rhex	Gecko	The robot's design consists of a rigid body with six compliant legs, each possessing only one independently actuated revolute degree of freedom. The attachment points of the legs as well as the joint orientations are all fixed relative to the body.
3	Roomba 675	i ROBO	**Weight(kg):** 3.5 **Suction mechanism for climbing** **Power(W):** 33 **Phone control:** Yes **Noise level(dB):** 65 **Navigation algorithm:** Random, spot Sensors Used: photocell, bumper sensor, infrared sensor, optical sensor.

Literature Survey:

Sr No	Title	Company/ Publication	Specifications
4	Sophinique X5	RHex	**Weight :** 3.25Kg **Suction mechanism :** Vacuum motor **Android compatibility :** Bluetooth/Wi-Fi **Input Voltage :** AC 240V **Climbing Mechanism :** Suction

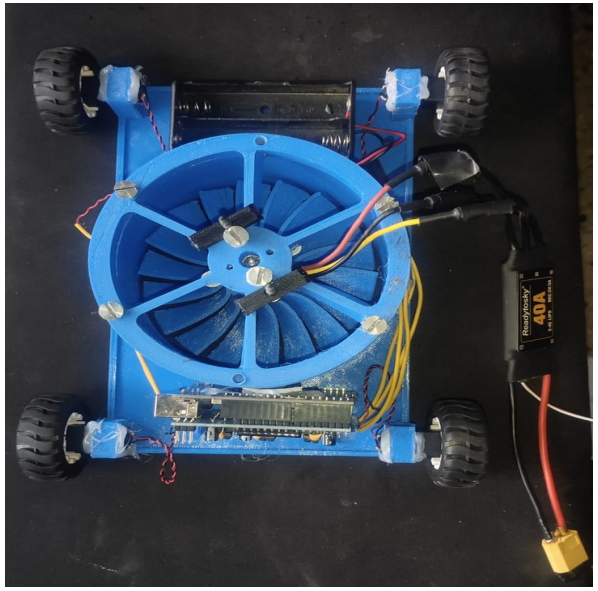
Methodology

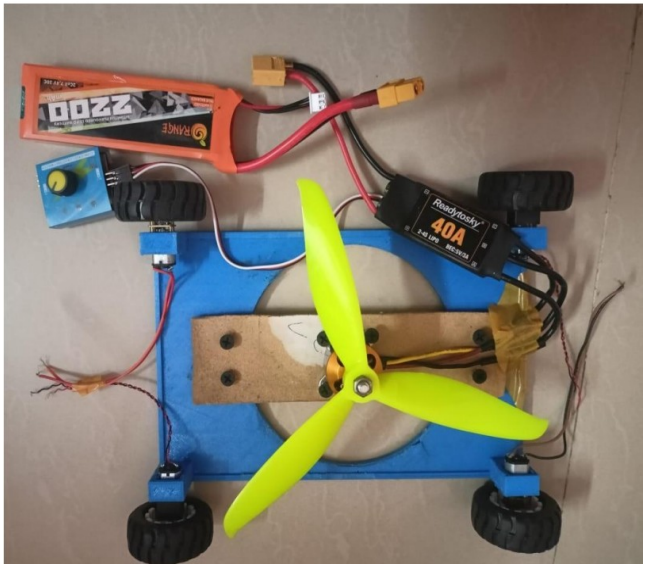
We are making an automatic window cleaning robot for reducing the high risk of falling off the building while cleaning the window glasses.
We are using BLDC motor with 8 inch propeller to make thrust of around 1Kg to make the bot climb over the 90 degree vertical surfaces. For movement of the bot we are using N20 motor with 1.6 Kgf/cm of torque, which helps the bot to move easily over the smooth surface of the glass efficiently. Bot will be equipped with autonomous moving algorithm and wet/dry cleaning functionality. It will have approx. 100-150 ml capacity of water tank mounted on the bot. For cleaning purpose we are using microfibre cleaning pad attach to the shaft of servo motor which will make to and fro linear movement to clean the glass of window.

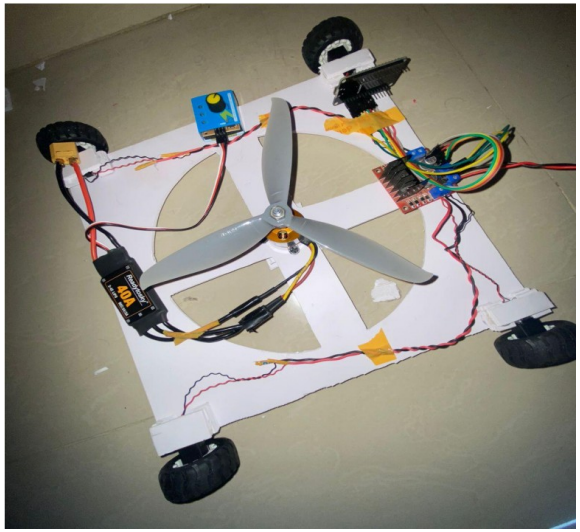
Features:

- **Climbing Mechanism :** Thrust using high speed BLDC Motor
- **Self locomotion:** Using sensors
- **Locomotion :** Wheeled locomotion
- **Cleaning Functions :** Wet & Dry
- **Android Compatibility :** Bluetooth / Wi-Fi
- **Cleaner :** Microfiber cloth
- **Costing :** Low cost (economical)

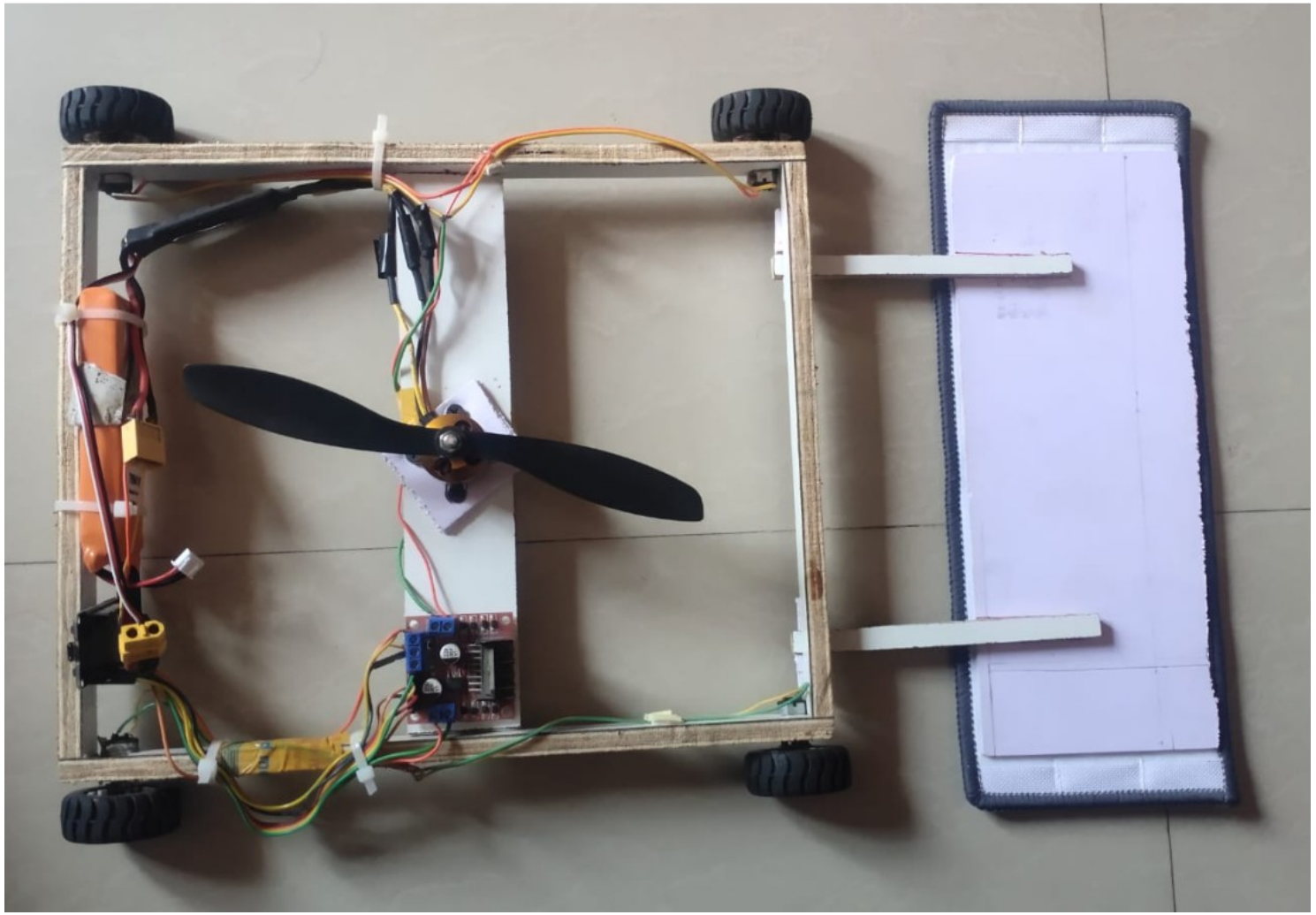
Project Model







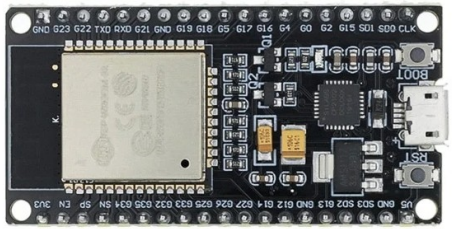
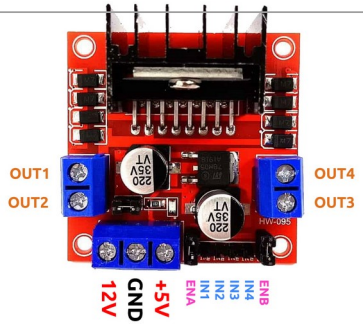
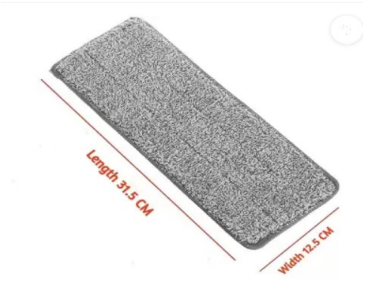
Project Model



Components Requirement and Specifications

	**Brushless Motor** Rating :2200KV Voltage :7.4 V max Speed :16280 RPM Weight :56gm	Rs 400/-
	**N20 DC motor:** Voltage range: 3V to 6 V Speed :30 rpm Torque :1.6 Kgf/cm Weight :10 g	Rs 150/-
	**Electronic Speed Controller** Current : 40 Amp BEC : 5V / 3 Amp	Rs 950/-
	**Li-Po 2S-Battery** Voltage :7.4 V Capacity :2200 mah	Rs 1199/-

Components Requirement and Specifications

	**ESP32 : Microcontroller** Voltage : 7.4 V	Rs 400/-
	**Motor Driver: L298N** Voltage: 12 V	Rs 120/-
	**Cleaning Mop**	Rs 215/-
	**Servo Tester**	Rs 100/-

[1] **Wall climbing robot:** Mechanical design and implementation Researchgate.net
[2] **Design and Implementation of Wall Climbing Robot** by Nafiz Ahmed Chisty "International Journal of Computer Applications"
[3] **Analysis and optimization of the climbing robot with an adsorption system and adhesive belts** "International Journal of Advanced Robotics System"
[4] **Design and Development of wall climbing robot** by Hafiz Muhammad Bilal "Mechatronics and Control Engineering Department, University of Engineering and Technology"
[5] **Design, Fabrication and Testing of a Miniature Wall Climbing Robot Using Smart Robotic** Feet Gregory Wile* and Dean M. Aslam Micro And Nano Technology Laboratory, "Department of Electrical and Computer Engineering , Michigan State University"

[6] **Wall-Climbing Robot with Mechanically Synchronized Gait** Shrinath Deshpande, Arnol Bakse, Shivaraj Wabale, Arvind Deshmukh, "Digvijay Patil Robotics and Automation Laboratory, College of Engineering Pune."

[7] **Autonomous cleaning robot as a service** "Linköping's university Department of Computer and Information Science"

[8] **Development of Intelligent Floor Cleaning Robot** S Yatmono, M Khairudin, H S Pramono and A Asmara "Electrical Engineering Education Department, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia"

THANK YOU