S.E.V.A.

SEMI ELECTRONIC VACUUM AUTOBOT

GE107
TINKERING LAB

PROF. SUDEEPTA MISHRA

TEAM MEMBERS

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BRIEF ABOUT THE PROJECT

Due to urbanisation, as more and more people are moving towards the cities and they live alone in small flats without any family members, and also due to tight daily schedules, often basic household chores like cleaning the floor are ignored. So, the best option is to have someone or something to help.

To solve this problem through our project, we have designed a semi-autonomous vacuum cleaner bot which uses three ultrasonic sensors and one infrared sensor. After detecting steps and obstacles in its surroundings using the sensors, the Arduino board makes a wise decision in which direction to continue. Based on which it drives the DC motors using the L298-D driving module. When the vacuum cleaner moves forward, green light blinks, blue light blinks when it turns left or right, and red-light blinks when it moves backwards.

Also, there is an infrared sensor attached at the bottom of the cleaner so that when the sensor finds no ground below it at a particular distance, then it moves backwards for some time and then turns right. There are 3 motors, 2 of which drive the tyres and 1 which runs the fan in the vacuum cleaner which creates the suction effect and cleans up the floor.

Hardware of the cleaning bot developed:

1 Arduino Uno
3 Ultrasonic Modules - HC-SR04
1 Motor Driver - L298N
2 N20 Motors- 5 Volt
2 Mounting Brackets
2 N20 Motor Wheels
1 Switch
1 Voltage Regulator - LM7805
3 Lithium-Ion Battery - 3.7V
1 IR Module
Portable vacuum cleaner
1 Castor Wheel
Male to male wires

Software of the cleaning bot developed:

Arduino IDE

# Details of the different modules used in the project

Ultrasonic Module:

The ultrasonic sensor works on the principle of the SONAR and RADAR system which is used to determine the distance to an object. An ultrasonic sensor generates the high-frequency sound (ultrasound) waves. When this ultrasound hits the object, it reflects as echo which is sensed by the receiver. We have used HC- SR04 as ultrasonic module
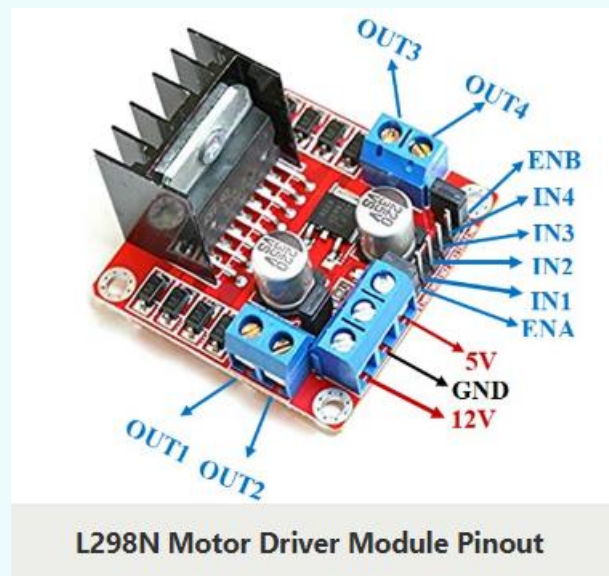

IR Module:

An IR proximity sensor works by applying a voltage to a pair of IR light-emitting diodes (LEDs) which in turn, emit infrared light. This light propagates through the air and once it hits an object it is reflected towards the sensor.
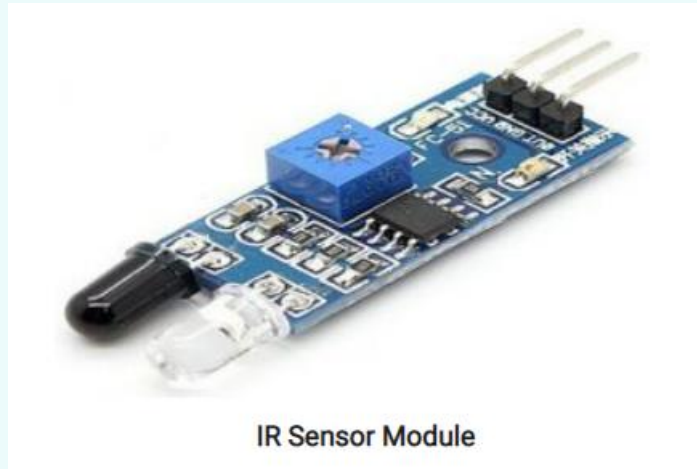
IR Sensor Module

L298N Motor Driver

L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control.

L298N Motor Driver Module Pinout

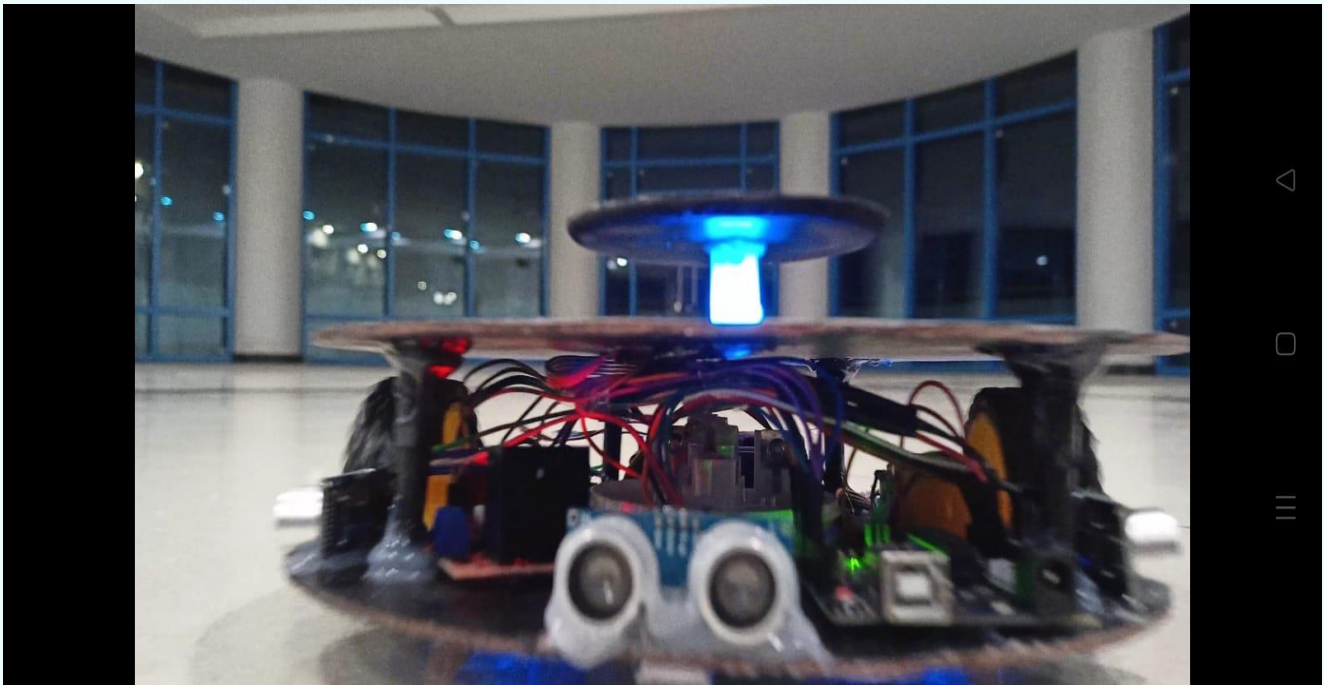# Circuit Diagram made using Tinker cad:
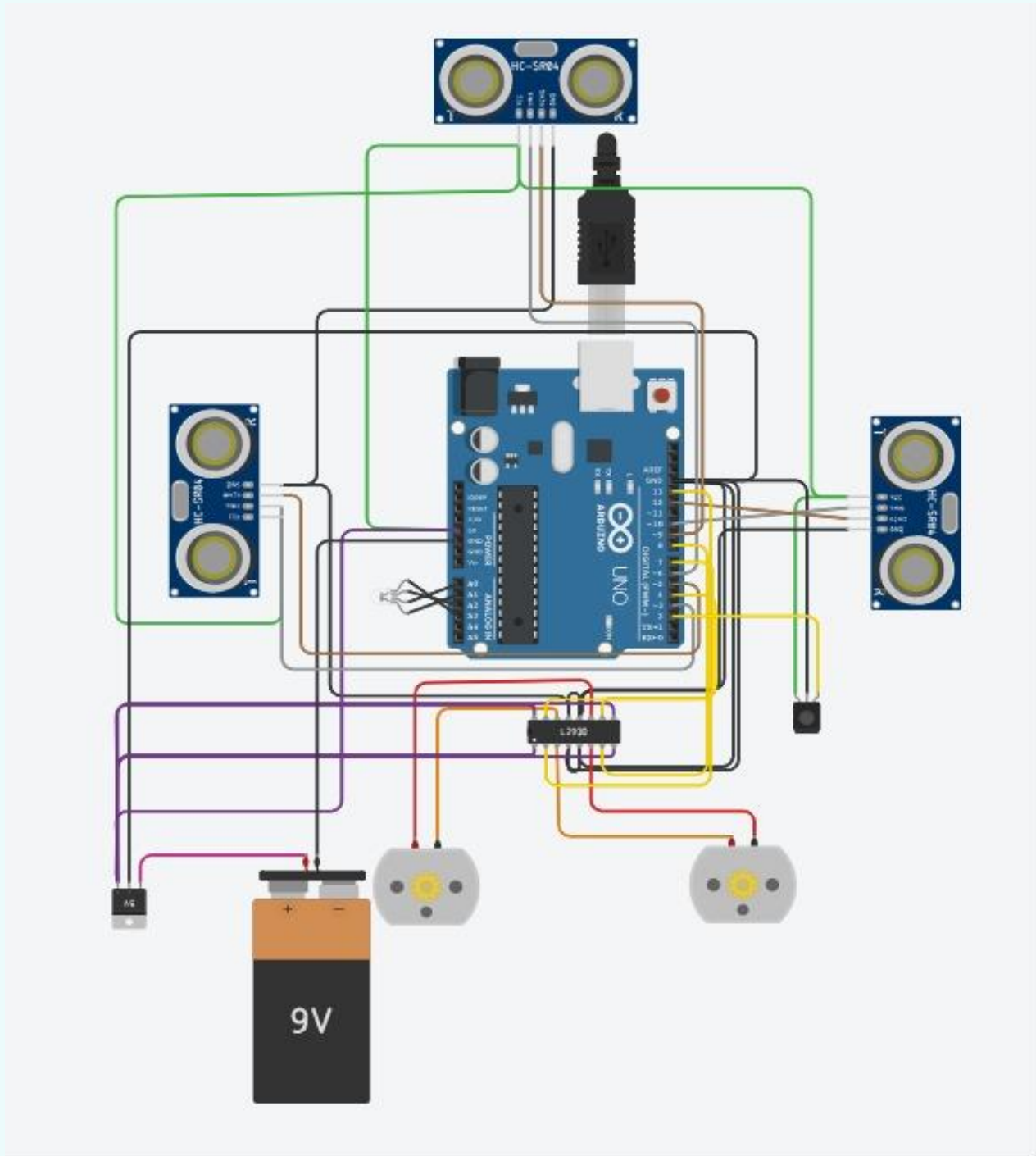
ACTUAL IMAGES OF THE PROJECT

Hardware connections

Outer body

Final working model

TESTING

Parameter	Value
Max speed	5 Km/hr
Max Working Time	30 Minutes
Terrain type	Tile, Marble, Ceramic, Road

Conclusion and Future Development:

In this project, we have successfully made a working prototype of the cleaner bot using Arduino, ultrasonic sensor, infrared sensor, etc. The prototype is able to detect obstacles and steps in its surroundings and move accordingly. In the future we can add the feature that the bot first maps the entire house and once mapped it starts the cleaning process. For this, we need more advanced sensors or advanced machine learning techniques. Further, we can use more powerful vacuum cleaners, bigger batteries. and use cameras or visual detectors to detect humans and pets to avoid any mishappening. We can add moping ability to provide better cleaning. One ambitious improvement that can be made is by programming the same bot to carry materials/ run basic errands around the house while cleaning.

THANK YOU