Floor Cleaner Robot with Self Charging Power Station

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Introduction:

- Addresses the need for efficient floor cleaning in today's fast-paced world.
- Designed an automated robot to eliminate manual effort in floor cleaning.
- Traditional methods such as mops and brooms are time-consuming.
- The robot provides autonomous floor cleaning in homes and offices.
- Utilizes sensors (likely ultrasonic) to detect obstacles and navigate surrounding.
- Ensures a clean and efficient cleaning experience with its autonomous functionality.

4 Literature Review

Author	Paper Title	Research Work
Joel Bergman and Jonas Lind	Robot Vacuum cleaner	To get the robot cleaner to the charging station, is by using GPS. If the robot vacuum cleaner uses a GPS, it can locate where it is in the house and locate where the re-charger.
Ching-Lung Chang , Chuan-Yu Chang , Zhi-Yuan Tang and Shuo -Tsung Chen	High–Efficiency Automatic Recharging Mechanism for Cleaning Robot Using Multi-sensor.	Operational flow of Ultrasonic sensor for obstacle avoidance and automatic recharging mechanism .

5 Components Comparison for Selection

Why we use	Why we not use
BO Motor :-Consumes less power, ideal for extended operation.	**DC Motor:-**Consumes more power, unsuitable for prolonged operation.
Ultrasonic Sensor:-Provides accurate obstacle detection and collision avoidance.	Other sensor types may lack the range or accuracy required for effective obstacle detection.
Motor Driver:-Ensures smooth and efficient motor control.	Alternative control methods may not offer the same level of precision or compatibility
Lithium Battery:-Offers high energy density and longer operational life.	Other battery types may have lower energy density and shorter operational times.
GPS Module :-Enables precise mapping and efficient navigation.	Other tracking technologies may not offer the same level of accuracy or real-time positioning.
Battery Level Indicator:-Monitors battery status for timely recharging, minimizing downtime.	Alternative monitoring methods may lack accuracy or real-time capabilities.

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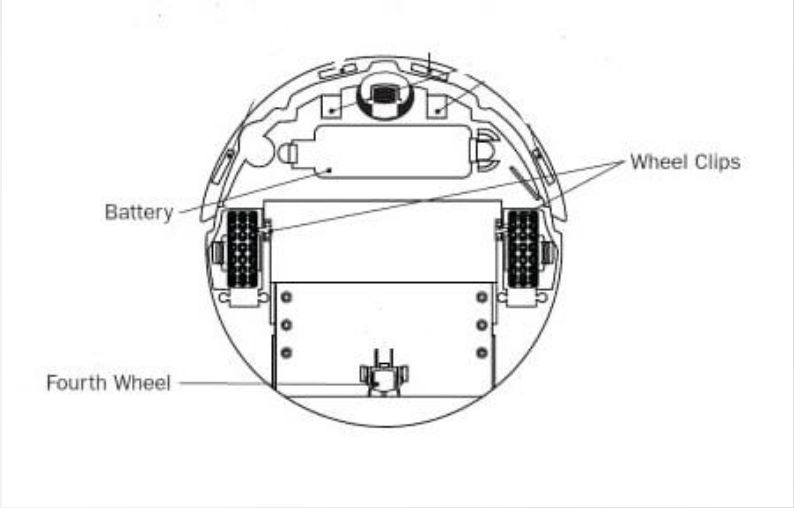
Design Methodology

- Advantages of Circular Shape :-

1. A round shape allows for better mobility and navigation around obstacles and corners.
2. A round shape reduces the likelihood of the floor cleaner getting stuck in corners or tight spaces.

- Drawbacks of other shapes:-

1. Other shapes of the floor cleaner getting stuck in corners or tight spaces.



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Research on Components

- Microcontroller Selection Criteria

Feature	ESP32	Arduino Uno	Raspberry Pi
Price	Moderate	Most Affordable	Most Expensive
Processing Power	Good	Low	High
Memory	Lower	Low	High
Connectivity	Built-in Wi-Fi/Bluetooth	Limited (External)	Built-in Wi-Fi/Bluetooth (optional add-on)
Learning Curve	Moderate	Beginner Friendly	Steeper
Community Support	Large	Largest	Largest
Power Consumption	Low	Moderate	High
Form Factor	Compact	Compact	Bulkier
Best for	IoT projects, Wearables	Basic Electronics	Desktop Applications, Media Centers

Finalized Components

- Ultrasonic Sensor
- Microcontroller(ESP32)
- Motor Driver
- Battery
- Battery level Indicator
- Stepper Motor
- BO Motor with wheels

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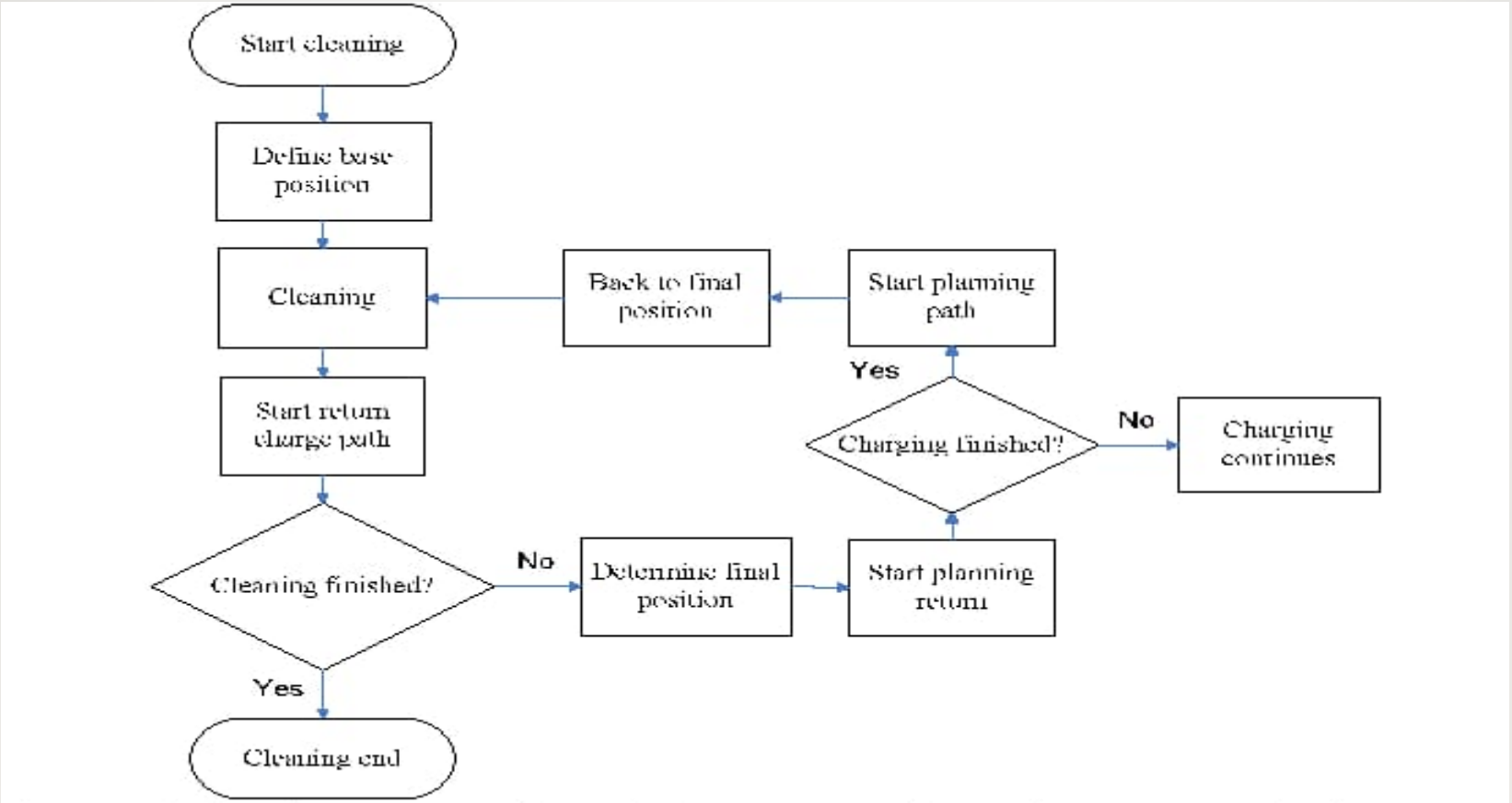
Flow Chart


Start cleaning
Define base position
Cleaning
Back to final position
Start planning path
Yes
Start return charge path
Charging finished?
No
Charging continues
Cleaning finished?
No
Determine final position
Start planning return
Yes
Cleaning end

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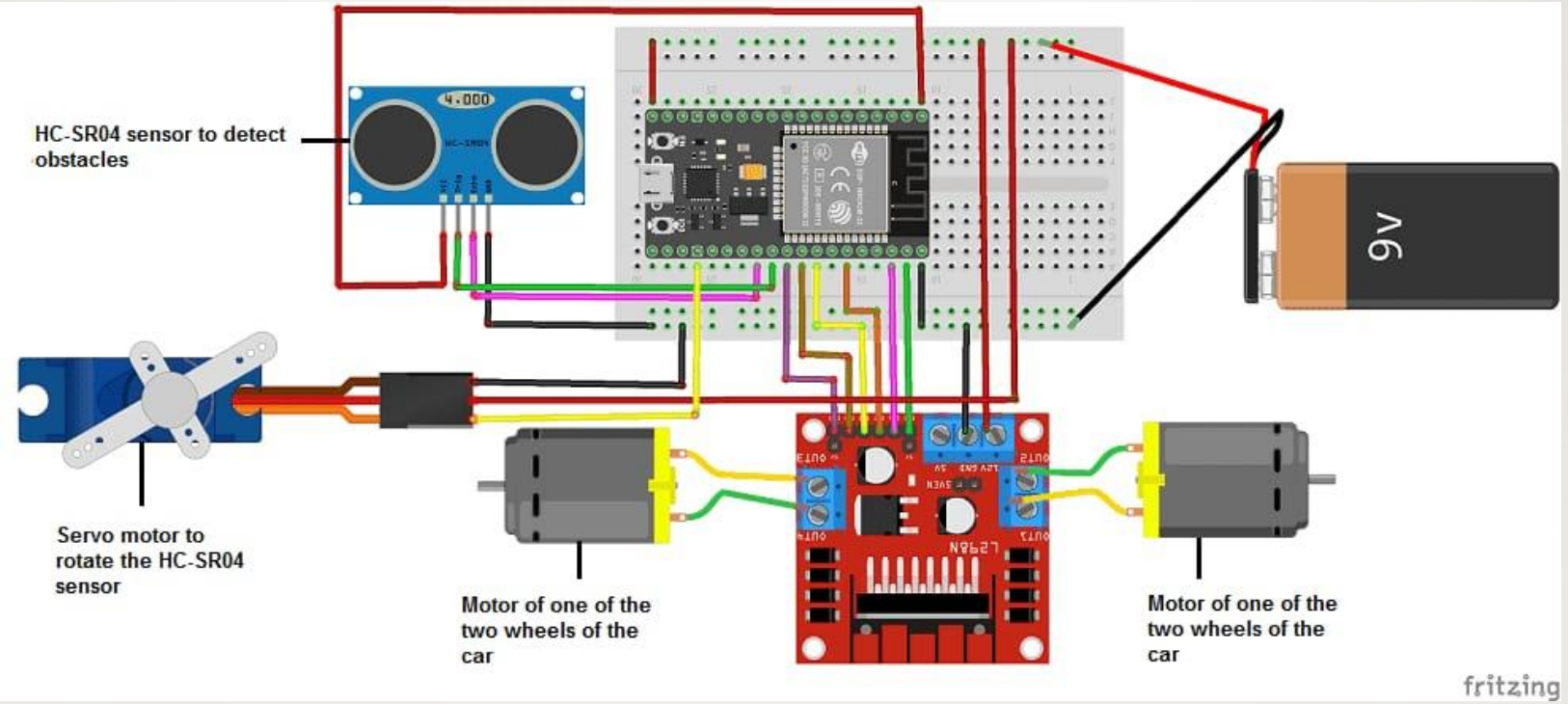
Circuit diagram



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Testing 1

- Testing 1 Errors

1. Power consumption
2. Mismatch of dimensions of sponge and wheel
3. Motor driver connection
4. Code Error

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Power consumption

- For your floor cleaning robot, a **geared DC motor (BO motor)** is likely the better choice compared to a regular DC motor,
- **Here's a breakdown of the key points:**

Feature	DC Motor	Geared DC Motor (BO Motor)
Speed	Higher	Lower (due to gear ratio)
Torque	Lower	Higher
Size and Weight	More compact	Can be compact
Suitability for Floor Cleaning Robot	Less suitable	More suitable

- BO motor is the recommended choice for most floor cleaning robot projects due to its focus on torque and maneuverability.

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Mismatch of dimensions of Sponge and wheel

Our floor cleaning robot design faces a challenge due to a mismatch between the diameter of the wheels (65mm) and the size of the cleaning sponge.

Details:

•The robot utilizes 65mm diameter wheels made of rubber.

•The cleaning task requires a larger sponge for optimal floor coverage and cleaning efficacy.

•Unfortunately, the current sponge size is too large to fit comfortably on the existing wheels.

Impact:

- Reduced Cleaning Efficiency
- Uneven Pressure Distribution
- Potential for Damage:

Solution Strategies:

1. Find a Compatible Sponge
2. Modify the Sponge
    1. Cutting
    2. Shaping
    3. Segment the Sponge
    4. Coverage
    5. Thickness

Motor Driver

- Our initial design for the floor cleaning robot encountered a limitation due to the choice of the L293D motor driver. This motor driver wasn't suitable for the demands of the project.
- **Details:**
- The floor cleaning robot utilizes DC motors (likely for mop rotation and movement) that require a certain level of current to operate effectively.
- The L293D motor driver has a maximum current output of **600mA per channel**.
- This current capacity proved insufficient for the power demands of the DC motors in the robot, leading to potential issues.

Key Differences Between L293D and L298N Motor Drivers:

The main differentiating factors between the L293D and L298N motor drivers are:

Feature	L293D Motor Driver	L298N Motor Driver
Maximum Current per Channel	600mA	2A
Driver Type	Half-H Bridge	Full-H Bridge
Motor Control	Independent control for each motor (2 DC motors)	Bi-directional control for 2 DC motors simultaneously
Operating Voltage	4.5V to 36V	4.5V to 46V

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Code

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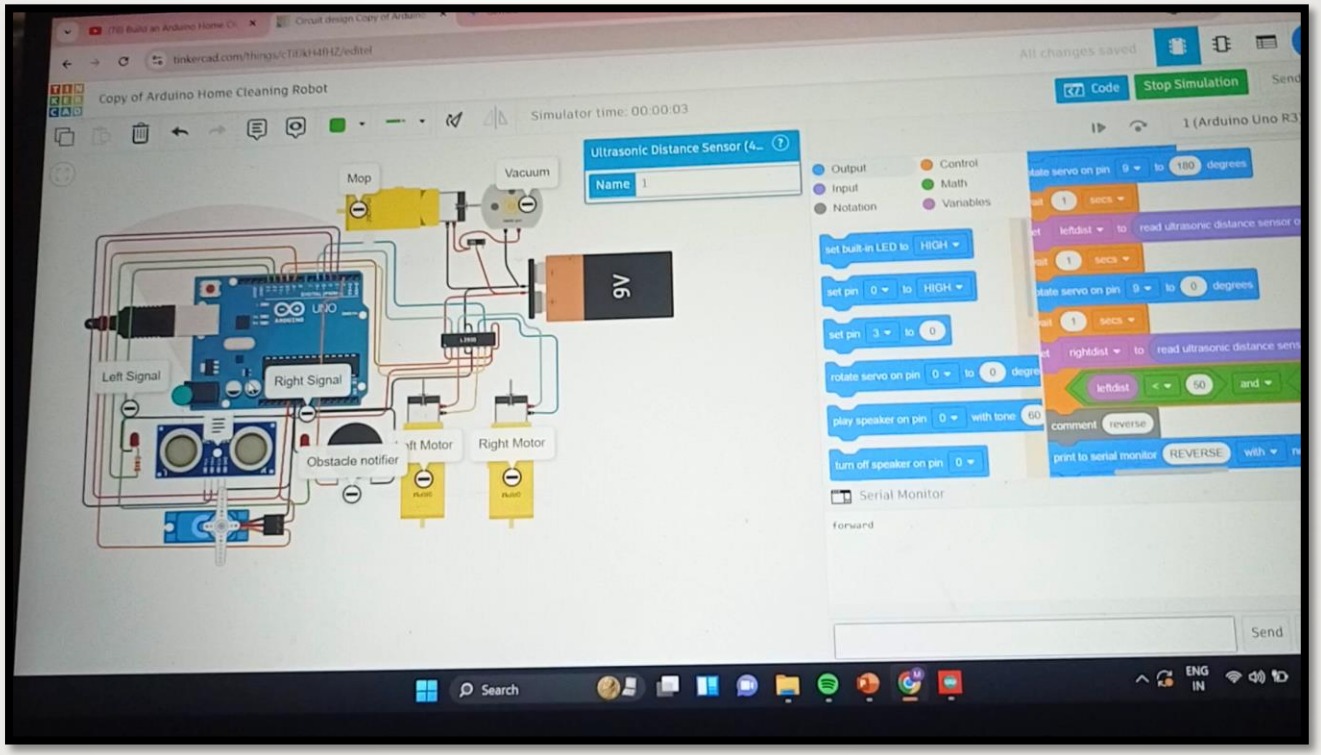
Simulation



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Thank you……