IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, February 2026
Impact Factor: 8.2

Smart Floor Cleaner Robot

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Abstract: *The Smart Floor Cleaner Robot is an automated cleaning system designed to make household cleaning easier and more efficient. This robot uses sensors to detect obstacles and navigate around furniture while cleaning the floor. It can sweep and mop surfaces with minimal human effort, saving time and energy. The system is designed to work on different types of floors such as tiles and marble. It operates using a rechargeable battery and follows a simple control mechanism for smooth movement. The Smart Floor Cleaner Robot is cost-effective, user-friendly, and suitable for modern homes and small offices. The Smart Floor Cleaner Robot is an automatic device designed for easy and efficient floor cleaning. It is a part of home automation technology, which helps perform household tasks automatically. The robot uses obstacle detection with the help of infrared and ultrasonic sensors to avoid objects while moving. A microcontroller acts as the brain of the system and controls all functions. It works as an automatic cleaning system that performs sweeping and mopping. Being a battery-operated robot, it uses path navigation to clean floors effectively*

Keywords: Smart Floor Cleaner Robot, Home Automation, Obstacle Detection, Infrared Sensors, Ultrasonic Sensors, Microcontroller, Automatic Cleaning System,Sweeping and Mopping,Battery Operated Robot, Path Navigation

I. INTRODUCTION

In today's busy lifestyle, keeping floors clean every day can be difficult and time-consuming. The Smart Floor Cleaner Robot is designed to solve this problem by providing an automatic and efficient cleaning solution. It is a robotic device that can clean floors without much human effort. The robot uses sensors to detect obstacles and move around furniture safely. It can sweep and mop different types of surfaces such as tiles, marble, and wooden floors. The system works on a rechargeable battery and is easy to operate. This project aims to reduce human effort, save time, and provide a smart cleaning solution for homes and small offices.

II. LITERATURE SURVEY

Many researchers have developed robotic floor cleaners to reduce human effort and improve home automation. Early models followed random movement patterns, while later designs used infrared and ultrasonic sensors for obstacle detection and better navigation. Some studies introduced mapping techniques for systematic cleaning. Recent developments combine sweeping and mopping functions in one system. Researchers also focus on battery efficiency and automatic charging. Overall, improved sensors, navigation systems, and cost-effective designs are the main advancements in smart floor cleaner robots.

III. PLATFORM TECHNOLOGY USED

The Smart Floor Cleaner Robot is built using a microcontroller-based platform such as Arduino, along with infrared and ultrasonic sensors for obstacle detection. It uses DC motors for movement, a motor driver for control, and a rechargeable battery as a power source. The system is programmed using embedded C or Arduino IDE software.

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IV. PROBLEM STATEMENT

Cleaning floors regularly is time-consuming and physically tiring, especially for working people and elderly individuals. Dust and dirt accumulate daily, affecting hygiene and health. Manual cleaning methods require effort and may not always provide consistent results. Therefore, there is a need for an automatic, cost-effective, and efficient cleaning solution. The Smart Floor Cleaner Robot is designed to reduce human effort by providing an intelligent system that can clean floors automatically while avoiding obstacles and covering the area effectively.

V. AIM AND OBJECTIVES

The aim of this project is to design and develop a Smart Floor Cleaner Robot that can clean floors automatically with minimum human effort. The robot is intended to make daily cleaning tasks easier, faster, and more convenient. It focuses on improving cleanliness and hygiene while saving time and physical energy. The project also aims to introduce an affordable and practical solution that can be easily used in homes and small offices without requiring technical knowledge.

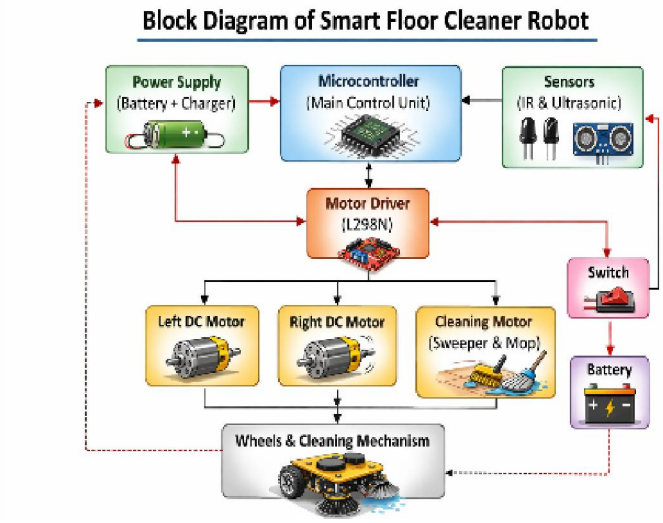
Objectives

The objectives of this project are to build a robot that can perform both sweeping and mopping functions effectively. It should use infrared or ultrasonic sensors to detect and avoid obstacles while moving. The robot must follow a proper path navigation system to cover the maximum cleaning area. It should operate using a rechargeable battery for portability and energy efficiency. Additionally, the system should be user-friendly, cost-effective, and reliable for everyday use.

VI. CIRCUIT DESIGN AND SYSTEM ARCHITECTURE

The circuit of the Smart Floor Cleaner Robot is designed around a microcontroller, which acts as the main control unit. Infrared and ultrasonic sensors are connected to the microcontroller to detect obstacles. A motor driver is used to control the DC motors for movement. The cleaning motors for sweeping and mopping are also connected through the driver circuit. A rechargeable battery supplies power to all components. Proper wiring and voltage regulation ensure safe and smooth operation of the system.

1.1 Block Diagram



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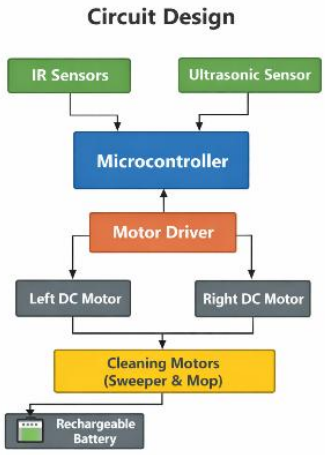
1.2 Circuit Diagram



1.3 Flow Chart

Input:

The robot receives input from sensors that detect obstacles and surroundings. The power button or start switch also gives input to begin operation.

Brain:

The microcontroller works as the brain of the robot. It understands the signals from the sensors and decides how the robot should move and clean.

Output:

The output is the movement of the wheels and the working of the sweeping and mopping system.

Power Control:

A rechargeable battery provides power to the robot, and the power control system ensures all parts get the required and safe amount of electricity.

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VII. COMPONENTS / MATERIALS

The Smart Floor Cleaner Robot uses several important components and materials to work properly. The main component is a microcontroller (like Arduino) which acts as the brain of the robot. IR sensors and ultrasonic sensors are used to detect obstacles and avoid collisions. DC motors help the robot move, and a motor driver (like L298N) controls the motors.

For cleaning, it uses sweeping brushes and a mopping mechanism. A rechargeable battery provides power to the system, and a voltage regulator ensures safe power supply. The robot also includes wheels, a chassis (body frame), connecting wires, and a power switch. All these components work together to make the robot move and clean efficiently.

VIII. WORKING

When the Smart Floor Cleaner Robot is switched ON, the rechargeable battery supplies power to all the components. The microcontroller, which acts as the brain of the robot, starts controlling the system. The sensors such as infrared (IR) and ultrasonic sensors begin scanning the surroundings to detect obstacles like walls, furniture, or other objects.

The sensor data is sent to the microcontroller for processing. If no obstacle is detected, the robot moves forward with the help of DC motors. If an obstacle is found, the microcontroller immediately sends signals to the motor driver to change direction, preventing collision.

At the same time, the sweeping brushes rotate to collect dust and dirt into a dust container. The mopping mechanism may spray a small amount of water and wipe the floor to remove stains. This cleaning process continues automatically, covering the area efficiently.

The robot keeps repeating this cycle of detecting, moving, and cleaning until the task is completed or the battery level becomes low. When the battery is low, the robot stops or moves to a charging point if available.

IX. RESULTS

The Smart Floor Cleaner Robot successfully cleans the floor by automatically sweeping
and mopping without much human effort. It is able to detect obstacles and change its direction smoothly, which prevents collisions with walls and furniture. The robot covers a good area of the floor and removes dust, small particles, and light stains effectively. It works efficiently on different types of surfaces like tiles and marble. The battery backup is sufficient for normal room cleaning. Overall, the project shows that the robot reduces manual work, saves time, and provides a simple and effective cleaning solution. assistive purposes.

X. ADVANTAGES &APPLICATION

1. Advantages

- Reduces human effort by cleaning automatically.
- Saves time in daily cleaning tasks.
- Detects and avoids obstacles safely.
- Improves cleanliness and hygiene.
- Works on rechargeable battery for easy use.

2. Applications

- Used in homes for regular floor cleaning.
- Suitable for small offices and shops.
- Helpful for elderly and busy people.
- Can be used in classrooms and hospitals.
- Maintains cleanliness in small commercial spaces.

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XI. FUTURE SCOPE

In the future, smart floor cleaner robots will become very common in homes. They will get smarter and clean better without much help from people. They will understand the house layout, avoid obstacles easily, and even decide when cleaning is needed.

They will also connect with smart home systems, so you can control them using your phone or voice. Prices will become more affordable, so more families can buy them.

Not only homes, but offices, hospitals, and big buildings will also use these robots.

In short, these robots will save time, reduce hard work, and become a normal part of daily life — just like washing machines and refrigerators.

XII. CONCLUSION

Smart floor cleaner robots have a very bright future. They will become smarter, more useful, and easier to use. As technology improves, they will save people more time and effort in daily cleaning.

In the coming years, these robots will not be a luxury item — they will become a normal and important part of every home and workplace. Overall, they will make life more comfortable, cleaner, and more convenient for everyone.

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