

# Floor cleaning Robot “The Sparkle Boat”

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## Abstract

The state-of-the-art floor cleaning robot is a cutting-edge solution designed to revolutionize household floor maintenance. It offers a range of innovative features that not only streamline cleaning processes but also cater to diverse cleaning needs. With a high capacity rechargeable battery, the robot can clean for extended periods without frequent recharging, allowing users to set schedules or let it work uninterrupted. An robot provides water control for precise mopping, safeguarding sensitive flooring from excessive moisture. The inclusion of a remote control enhances usability, allowing manual guidance or remote control for spot cleaning. The robot's changeable mopper permits customization with various mop types, adapting to different cleaning preferences and floor conditions. Advanced obstacle detection technology ensures efficient navigation around furniture and obstacles while minimizing the risk of collisions. Moreover, the robot's floor type detection sensors enable it to automatically adjust cleaning settings, optimizing the cleaning method for various floor types. This innovative cleaning solution offers convenience, efficiency, and adaptability, making it a valuable addition to any household.

**Keywords:** robot, innovative cleaning, precise mopping Household appliance



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## INTRODUCTION

The floor cleaning robot is a revolutionary household cleaning solution that not only simplifies the chore of keeping your floors spotless but also adds a layer of smart technology for unprecedented convenience. With a powerful rechargeable battery, the robot can clean for extended periods, sparing users the hassle of frequent recharging. This feature is especially advantageous for those who want to establish regular cleaning schedules or simply allow the robot to work until the entire area is pristine, free from any power interruptions. The Android application compatibility takes this cleaning robot to the next level of user-friendliness. Through the app, users can control the robot's water supply for mopping with remarkable precision. This means that you can start and stop the water flow as needed, ensuring that sensitive floorings like hardwood are protected from excess moisture. It's a game-changer for those who are meticulous about their floor maintenance. One of the standout features is its advanced obstacle detection technology. This feature allows the robot to navigate around furniture and other obstacles with precision. You can trust it to clean efficiently while minimizing the risk of collisions and damage to both your furniture and the robot itself. It's a level of automation and intelligence that makes daily floor maintenance a breeze. What truly sets this cleaning robot apart is its ability to detect different floor types, including wood, tile, and carpet. This smart capability enables the robot to automatically adjust its cleaning settings, ensuring that the most suitable cleaning method is

applied to each type of floor. For instance, it might use more water for mopping on tiles and less on hardwood. This adaptability ensures that your floors receive the tailored care they deserve. Moreover, the robot comes with a changeable mopping attachment that allows users to switch between different mop types, such as microfiber or disposable mop pads. This flexibility caters to your unique cleaning preferences and adapts to the specific condition of your floors, whether you need a deep clean or a quick touch-up. In summary, this state-of-the-art floor cleaning robot represents a leap forward in household cleaning technology, making floor maintenance efficient, adaptable, and hassle-free.

## LITERATURE SURVEY

Ashish Mohan, "Design and Simulation of an Autonomous Floor Cleaning Robot with Optional UV Sterilization," [1] 2022 - The paper mainly describes the design and stimulation of an autonomous robot for floor vacuum cleaning, wet mopping and an optional UV sterilization in the absence of the patients in hospital rooms. There are many floor cleaning robots available in market such as Roomba robot, Scooba robot etc. which are very expensive this robot is designed in such away it fits the pocket of a common man but at the same time serves all the purpose of a cleaning robot. The robot contains ultrasonic sensors and IR sensors to detect any obstacle in front of the robot and a LIDAR sensor, vacuum cleaner to remove dust on the floor and cleaning mops. Anshu Prakash Murdan, "A smart autonomous floor cleaner with an Androidbased controller,

"[2] 2022 ^a This paper presents the design and implementation of a smart autonomous floor cleaner with an Android-based controller. The implementation is based on an Arduino MEGA microcontroller, a floor cleaner system and a mobile application with wireless connectivity. The Android application features a secure user login system and connects to the robot cleaner through Bluetooth. It can be used to control the robot motion to guide it in a specific direction to vacuum or mop the floor

G. Deepa, "ROBOVAC-Automatic Floor Cleaning Robot," [3] 2021 - In this technological era, currently people have taken a liking to develop new designs related to low-cost flooring robots. One of the challenges has been to reduce the number of sensors as it contributes considerably to the cost of the robot. Robovac - automatic floor cleaning robot is designed in such a way that the robot can navigate and clean a floor at the simultaneously. It involves hardware construction and software implementation. The four wheels help the robot to move in different and desired direction. Cleaning brush is placed in front of the cleaning bot to perform necessary cleaning process. ATMEGA 328 microcontroller and a L293D motor driver are incorporated into the cleaning robot for processing sensors signals and controlling DC motors. LCD Display provides the status of the robot. Beiquan Fan, "Floor Climbing Cleaning Robot Based on Slide Rail Lifting Structure,"

[4] 2020 - The cleaning of the steps in the stairwell cannot be ignored, but it requires labor and material resources, so a device that can replace manual cleaning is obviously very much needed. The robot can efficiently and stably clean the stair area within the specified range within a set time and any time period. The device is a robot for cleaning stairs and platforms, which can automatically go upstairs and clean the surface of the stairs. The device is equipped with two independent suspension systems at the front and rear to adapt to stairs with different height differences and to complete the movement of going upstairs or steps. The steering wheel controls the forward and backward movement of the four wheels to achieve the movement of the entire machine, and the wheels can be rotated horizontally to move left and right to achieve the entire sweep of all corners of a single staircase.

## AIM & OBJECTIVES

1. Convenience and Streamlined Cleaning: To simplify and automate the floor cleaning process, reducing the effort and time required for users to maintain clean floors.

2. **Extended Cleaning Periods:** To enable the robot to clean for longer durations without frequent recharging, offering users the flexibility to set schedules or allow uninterrupted cleaning.
3. **Precise Mopping Control:** To ensure the robot can mop floors with water control, preventing excessive moisture that may harm sensitive flooring.
4. **Usability and Versatility:** To enhance usability with a remote control feature, allowing manual guidance and remote control for spot cleaning as needed.
5. **Customization:** To provide customization through changeable moppers that can accommodate various mop types, catering to different cleaning preferences and floor conditions.
6. **Efficient Navigation:** To incorporate advanced obstacle detection technology for efficient navigation around furniture and obstacles while minimizing the risk of collisions.
7. **Floor Type Optimization:** To automatically detect different floor types and adjust cleaning settings accordingly, optimizing the cleaning method for each type.

Overall, the objective is to offer a cleaning solution that maximizes convenience, efficiency, and adaptability, making it a valuable addition to any household for maintaining clean floors.

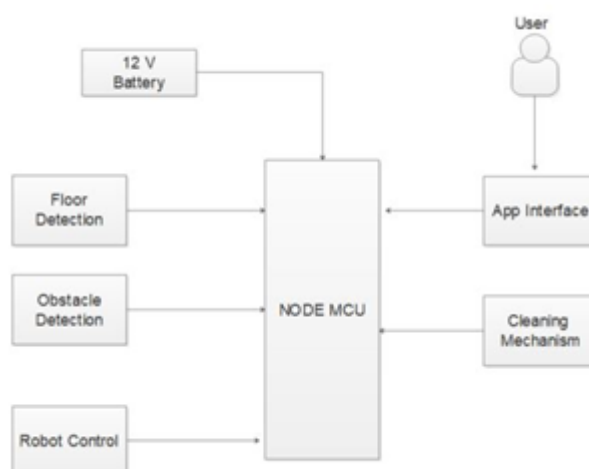
### **MOTIVATION**

The motivation behind the development of the floor cleaning robot stems from a profound desire to enhance the quality of life for individuals and families. In our fast-paced, modern world, time is a precious resource, and household chores can often become a significant burden. The creation of this cutting-edge cleaning solution is driven by the aspiration to provide unparalleled convenience and efficiency in our daily lives. By equipping the robot with a high-capacity rechargeable battery, user-friendly controls, advanced obstacle detection, and floor type recognition, we aim to alleviate the time and effort required for floor maintenance. We want to empower individuals to reclaim their time, redirecting it towards more meaningful activities, whether it's spending quality moments with loved ones, pursuing personal interests, or simply enjoying a well-deserved break. With this innovative robot, we aspire to make a tangible difference in the lives of our users, simplifying one of the most common and time-consuming household tasks and ultimately contributing to a more balanced and fulfilling lifestyle.

### **APPLICATION:**

- **Residential Use:** The primary application is in residential settings, where homeowners can rely on the robot for routine floor maintenance, freeing up time for other activities.
- **Commercial Spaces:** Small business owners, especially in the hospitality industry, can benefit from using robots to maintain clean floors in commercial spaces, such as hotels, restaurants, and office buildings.
- **Elderly and Physically Limited Individuals:** Those with physical limitations can use the robot as a valuable aid in floor cleaning, reducing the physical strain associated with traditional cleaning methods.
- **Tech Enthusiasts:** Tech enthusiasts who appreciate cutting-edge technology and automation will find the robot an exciting addition to their smart home ecosystem

## SYSTEM ARCHITECTURE



**Fig -1:** System Architecture Diagram

## ADVANTAGES

**Convenience:** The robot offers a high level of convenience, reducing the time and effort required for floor cleaning, making it especially appealing for busy individuals and families.

– **Efficiency:** Equipped with advanced obstacle detection and floor type recognition, the robot cleans with precision, minimizing the risk of collisions and ensuring the most suitable cleaning method for different floor types.

– **Customization:** The changeable mopping attachment allows users to customize their cleaning approach based on their preferences and the specific condition of their floors.

– **Water Control:** Users can control the water supply for mopping through a user-friendly Android application, providing precise control over wet cleaning and safeguarding sensitive flooring from excessive moisture. – **Remote Control:** The inclusion of a remote control device or interface allows for manual operation and spot cleaning, adding versatility to the cleaning process.

## FUNCTIONAL & NON-FUNCTIONAL REQUIREMENTS

### Functional Requirement:

**1. Rechargeable Battery:** The robot is equipped with a high-capacity rechargeable battery. This feature ensures that it can operate for extended periods without the need for frequent recharging. Users can set cleaning schedules or simply let the robot work until the entire area is clean without worrying about power interruptions.

**2. Water Control via Android Application:** The robot is compatible with a user-friendly Android application. Through this app, users can easily control the water connection for mopping. It allows them to start and stop the water supply as needed, enabling precise control over wet cleaning. This feature is particularly useful for protecting sensitive flooring like hardwood from excessive moisture.

**3. Remote Control:** The inclusion of a remote control further enhances the robot's usability. Users can guide the robot manually to specific areas or control its movements from a distance. This feature is handy for spot cleaning or addressing immediate spills and messes.

**4. Changeable Mopper:** The robot comes with a mopping attachment that is easily replaceable. This allows users to switch between different mop types, such as microfiber or disposable mop pads, to suit their cleaning preferences and the condition of the floors.

**5. Floor Type Detection:** The robot is equipped with sensors that can detect different types of flooring, such as wood, tile, or carpet. This capability allows the robot to adjust its cleaning settings automatically, ensuring the most suitable cleaning method for each type of floor. For example, it may use more water for mopping on tiles and less on hardwood.

## **Nonfunctional Requirements**

### **Security:**

1. All sensitive data stored in the various components of the system must be encrypted before they are stored.
2. The system must be able to use facility of qualified electronic signature of all documents uploaded in the system.
3. System must support appropriate security controls, including user roles with pre-defined access rights which control the data and functionality each user has access to

### **Auditability**

1. For critical system events (e.g. tender bid submission, auction bid submission, etc.), System must support methods with which the sender of data can be provided with evidence of delivery. Such evidence will be implemented by means of e-Mail.
2. System must be able to audit all system and user actions. System should ensure that all actions performed on received/stored data are recorded, keeping track of actors, date/time, input/output data and any other information necessary to allow specialized personnel to monitor and fully reconstruct a transaction.

### **Extendibility:**

1. System must be built in a modular approach that will allow the addition of new functional modules without impacting the overall system functionality. The need for this SW type of architecture is to allow the development of the system by different SW vendors, to avoid possible lock-downs or delays in system implementation and deployment cycle.
2. System must be based in an architecture that will allow the addition of extra HW resources to enhance the systems capabilities (e.g. performance, storage, bandwidth, etc.)

### **Portability:**

1. System must be designed in a manner that will not be coupled to any hardware specific technologies.
2. System must be possible to be deployed on different HW and SW infrastructures and not dependent on the software technology used for implementation. However, it is preferable to be implemented in one of the major and proven technology.

### **Performance:**

System must follow state-of-the-art interoperability standards so that its integration or communication with external systems can be achieved. System should be developed following Service Oriented Architecture

(SOA) and Open standard architecture. System needs to be developed in a way that will allow the creation and support of ^aWeb Services^a to exchange information between the system and external systems.

## SYSTEM REQUIREMENTS

### Software Used:

1. Operating System : Windows xp/7/8/10
2. Software Version : 3.1
3. Tools: Arduino IDE

### Hardware Used:

1. Robot Cassis
2. Motor
3. Motor Driver
4. Ultrasonic Sensor
5. NODE MCU
6. Battery
7. 12v Adapter
8. Mop
9. IR Sensor
10. Robot Wheels

## CONCLUSION

In conclusion, the floor cleaning robot project represents a significant leap in household cleaning technology, offering a range of advantages that cater to the evolving needs of modern households. The project's focus on convenience, efficiency, and customization aligns with the desire for time-saving solutions and smarter home management. With features like advanced obstacle detection, floor type recognition, and precise water control, the robot promises not only effective cleaning but also the safeguarding of different floor types. While the project has the potential to bring about transformative benefits for homeowners, businesses, and those with physical limitations, it is essential to acknowledge its limitations, including cost and maintenance requirements. Nonetheless, the robot's versatility in residential and commercial applications, catering to a diverse user base, underscores its potential as a valuable addition to the world of automated home appliances. As technology continues to shape our daily lives, projects like the floor cleaning robot exemplify how innovation can simplify our routines and contribute to a more convenient and efficient lifestyle.

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