Android Powered Floor Cleaning Robot

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***Abstract*—Here we propose a smart floor cleaning robot that allows for remote floor cleaning. The bot makes floor cleaning very easy and a fast process using a wireless robotic cleaning system. The user may sit at a place, start a bot and clean wherever needed. The system consists of a transmitter app. This app is run in an android mobile phone that allows user to transmit command based on user input. Based on these commands the transmitter sends movement commands to the robot. The transmitter is an android mobile phone that allows user to transmit commands to the robot. The robot consists of 2 cleaning pads with a water sprayer for efficient cleaning. The robot has 2 motorized rotating cleaning scrubs for the cleaning part. On receiving the movement commands from the android. On receiving the movement commands from the android device through Bluetooth receiver. The microcontroller on receiving the commands, decodes them and thus operates the motors in order to achieve the desired motion. Even the sprayer and cleaner mechanism can be controlled by the android app user. This makes floor cleaning a very easy, fast and an effortless process. tracking system is composed of a GPS receiver, Microcontroller and a GSM Modem. The Microcontroller processes this information and this processed information is sent to the respective numbers.**

Keywords—Home Automation, Robotic Vacuum Cleaner, IR Sensor, L293D, Android Phone

I. INTRODUCTION

The development of technological improvements nowadays has changed the development of robot design components, such as most applications for all jobs. With the Arduino Uno microcontroller control connected with a bluetooth connection, it can control the movement of the robot to clean the floor in cleaning the floor in a large house so that work can be done quickly and does not require household assistants so that it does not incur additional costs.

Robots in every industrial and business position are now needed. This is especially true in terms of cleaning the floors in the house so that the occupants of the house are protected from germs and diseases. Housewives who also work actively outside the home are helped recently so that housewives no longer have difficulty cleaning floors quickly and practically. So that the work of mothers is no longer hampered because they can complete it practically. With the Arduino Uno microcontroller control connected with a bluetooth connection, it can control the movement of the robot to clean the floor by tracing each side of the floor to clean the floor so it can be finished quickly.

In addition to its current features, the project has tremendous potential for future upgrades. Incorporating AI-powered navigation will enhance its obstacle avoidance and path optimization capabilities. Advanced dirt detection sensors can make cleaning more effective,

and eco-friendly modifications will help reduce energy and water consumption. These enhancements would further solidify its utility in environments like hospitals, educational institutions, and warehouses.

Overall, the is a forward-thinking solution that not only simplifies cleaning but also aligns with the growing demand for smart, sustainable technologies. This innovation reflects a thoughtful approach to leveraging robotics to address everyday challenges, making it a valuable addition to modern living spaces.

II. EXISTING SYSTEM

Traditional floor cleaning methods often involve manual labor or the use of simple, non-automated tools like brooms, mops, and vacuum cleaners. These methods are time-consuming, require significant physical effort, and often fail to achieve a consistent level of cleanliness. Automated floor cleaners currently on the market, such as robot vacuums, typically operate on predefined cleaning patterns and lack advanced navigation and adaptability, limiting their efficiency in complex environments.

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III. PROPOSED SYSTEM

The proposed AUTO CLEAN: Android-Powered Floor Cleaner aims to revolutionize floor cleaning by integrating advanced Android technology with autonomous robotic functionality. This system will leverage the processing power, sensor capabilities, and connectivity features of Android to enhance navigation, obstacle avoidance, and cleaning efficiency. Additionally, it will offer user-friendly controls through an Android app, allowing users to customize cleaning schedules, monitor progress, and receive notifications.

The main aim is to revolutionize floor cleaning by providing an efficient, user-friendly, and autonomous solution. It seeks to reduce the time, effort, and limitations associated with traditional cleaning methods and existing robotic cleaners. By integrating Android-based remote control, intelligent navigation, and advanced obstacle detection, the project aims to deliver a smart cleaning system that can adapt to various environments, ensuring thorough and hassle-free cleaning for homes, offices, and industrial spaces..

IV. METHODOLOGY

The initial phase involves identifying the limitations and challenges of traditional floor cleaning methods and existing robotic systems. Traditional cleaning methods are time-consuming, require significant manual effort, and lack flexibility, especially in navigating complex spaces. Similarly, existing robotic vacuums often operate on predefined cleaning paths, which makes them inefficient in dynamic or obstacle-filled environments. To address these gaps, a detailed system design is created, incorporating advanced components and technological solutions. The design focuses on integrating the controller, IR Sensor for object detection,Bluetooth module for wireless communication.

The hardware development stage focuses on assembling all the selected components into a functional and efficient robotic system. On the software side, the microcontroller is programmed to interpret data from the sensors, execute obstacle detection algorithms, and allow the robot to navigate autonomously. The Android app is designed to complement the system, offering features such as real-time monitoring, custom cleaning schedules, and the ability to send commands (e.g., start, stop, change paths) to the robot remotely. This integration ensures user-friendly operation and enhances the user experience.

Once the hardware and software are developed, rigorous testing is conducted to evaluate the entire system's functionality. This involves testing the robot's navigation

system,obstacle detection capabilities and cleaning performance under various conditions.

The Bluetooth connection is checked for reliability and seamless communication between the Android app and the robot. The testing phase also involves real-world trials to assess how well the system adapts to different environments, obstacle patterns, and cleaning challenges.Any issues identified during testing are addressed through iterative refinements, including tweaking software algorithms or adjusting hardware components. The goal is to ensure that the robot operates efficiently, navigates obstacles effectively, and meets user expectations for remote operation and cleaning performance.

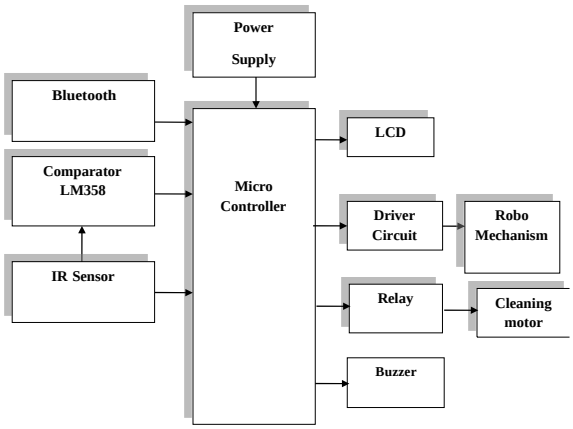

FIG 1 Block Diagram of Proposed System

Applications

- Helps detect obstacles and navigate safely.
- It can be used for cleaning residential spaces, reducing the need for manual labor.
- Efficiently maintains cleanliness in office spaces, saving time and effort.
- Ensures hygiene by cleaning floors in hospitals, clinics, and healthcare facilities.
- Provides real-time assistance in unfamiliar environments.
- Can integrate with smart home systems for automatic and scheduled cleaning.

V. HARDWARE DETAILS

Microcontroller: The microcontroller serves as the brain of the Android-Powered Floor Cleaning Robot. It processes data received from the sensors, executes navigation algorithms, and sends commands to the motors and other components. This is a reliable and efficient microcontroller that coordinates the overall operation of the robot. It allows the system to analyze environmental data, plan routes, and control movements for effective obstacle avoidance and cleaning

IR sensor: The IR sensors are critical for obstacle detection and navigation. They help the robot map its surroundings by detecting nearby objects and obstacles in its path. When an obstacle is detected, the system uses this data to adjust the route, ensuring that the robot avoids collisions and continues efficient cleaning without getting stuck. These sensors contribute significantly to the autonomous navigation system

Bluetooth Moduke: The Bluetooth module enables wireless communication between the Android-Powered Floor Cleaning Robot and the user's Android device. Through this module, users can send remote commands to the robot, such as starting, stopping, or setting cleaning schedules. It also allows real-time monitoring, giving users insights into the robot's cleaning progress and system status.

Driver Circuit: The motor driver circuit acts as an interface between the microcontroller and the motors. It ensures that commands from the microcontroller are correctly translated into motor actions, such as controlling speed and direction. This allows the robot to navigate effectively and clean efficiently,

responding quickly to environmental changes or user commands.

Buzzer: The buzzer is an essential hardware component in the Android-Powered Floor Cleaning Robot, acting as an alert system to enhance user interaction and safety. It provides audio signals to notify users of key events such as obstacle detection, low battery levels, technical malfunctions, or the start/stop of cleaning operations. Integrated with the microcontroller, the buzzer ensures real-time feedback, allowing users to monitor the robot's status, respond to errors, or track its operation during cleaning tasks.

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DC Motors: DC motors are used to drive the robot's wheels, allowing it to move forward, backward, and make turns as required. They provide smooth and consistent motion, ensuring the robot can navigate various surfaces and environments effectively. Additionally, DC motors are connected to the microcontroller, which sends commands to control their speed and direction. Their reliability, ease of control, and efficiency make them essential for maintaining the robot's autonomous navigation and cleaning performance.

Relay : Relay is an important hardware component in the Android-Powered Floor Cleaning Robot that acts as an electrical switch to control high-power devices using low-power signals. It allows the microcontroller to control various components such as motors, sensors, or other peripheral devices without requiring the microcontroller to handle high current directly. The relay receives signals from the microcontroller and activates or deactivates connected circuits accordingly, ensuring the robot operates safely and efficiently.

VI. SOFTWARE DETAILS

KEIL is an essential tool for the development of the Android-Powered Floor Cleaning Robot as it provides a complete integrated development environment (IDE) for programming and debugging the microcontroller at the core of the system. In this project, the microcontroller is the main control unit, and KEIL is used to write, compile, and debug the code that manages motor control, sensor input processing, obstacle detection, navigation, and Bluetooth communication. KEIL allows developers to simulate and test the functionality of the microcontroller's algorithms, ensuring they work as expected before deploying them on the actual hardware.

Using KEIL, the programming logic for sensor processing (e.g., IR sensor input for obstacle detection), motor movements (controlled by DC and stepper motors), and wireless communication with the Android application via Bluetooth can be efficiently written, debugged, and optimized. This ensures smooth navigation, efficient cleaning paths, and proper obstacle avoidance in real-world conditions. KEIL's simulation tools allow testing these features virtually, reducing development time and ensuring the robot operates reliably during deployment. Therefore, KEIL plays a vital role in the design, testing, and validation of the software components of the Android-Powered Floor Cleaning Robot, enabling efficient embedded system development and implementation.

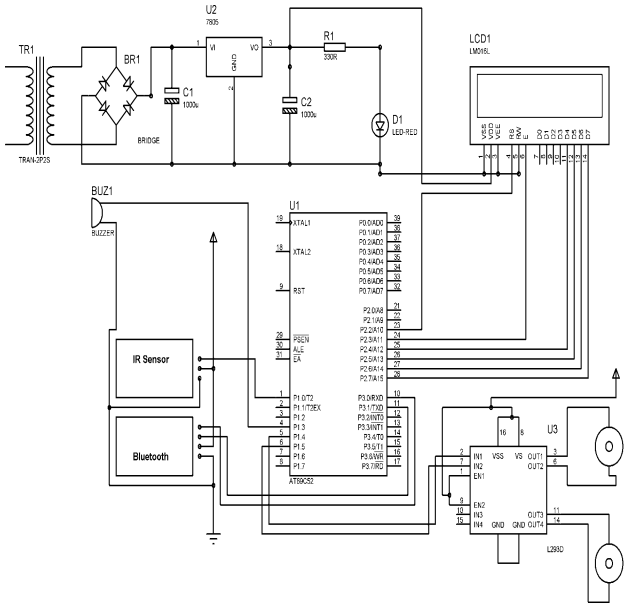

FIG 2 Schematic Diagram of Proposed System

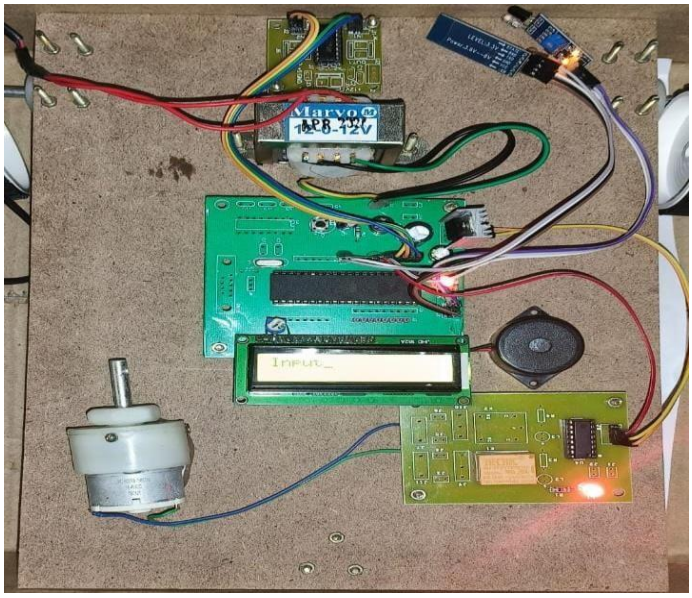

FIG 3 Prototype of Proposed System

VII. CONCLUSION

The prototype of the Android-Powered Floor Cleaning Robot represents the initial working model that demonstrates the feasibility and functionality of the proposed system. It integrates both hardware and software components, combining sensor-based navigation, motor control, and Bluetooth communication with a user-friendly Android application. The prototype serves as a proof of concept to validate the design, test the robot's performance, and identify areas for improvement before full-scale production.

It is designed in a simple and efficient way to make it user-friendly, easy to build, and cost-effective. The design uses essential components and straightforward technology to ensure the robot performs its cleaning tasks without unnecessary complexity. A simple design makes it easier to maintain, troubleshoot, and upgrade if needed. It allows the robot to focus on key tasks like cleaning, obstacle detection, and navigation without adding unnecessary features that can complicate its operation or make it expensive. By keeping the design simple, the system can be easily controlled using an Android application via Bluetooth, making it accessible to all user.

Additionally, the simple design enhances user experience by allowing easy remote operation through the Android application and Bluetooth technology. Users can quickly send commands, monitor progress, or schedule cleaning without needing advanced technical knowledge. This minimalistic approach ensures that anyone can operate the robot efficiently, emphasizing practicality, ease of use, and efficiency for everyday cleaning tasks.

Overall, the Android-Powered Floor Cleaning Robot is designed to prioritize efficiency, affordability, and user convenience. It integrates essential hardware and software components like navigation algorithms, obstacle detection, and motor control to ensure smooth and autonomous cleaning. Bluetooth communication with the Android application allows users to monitor and control cleaning tasks remotely. The minimalistic design reduces complexity, making it easier to maintain, upgrade, and troubleshoot. This approach ensures practicality, reliability, and a seamless user experience while addressing everyday cleaning needs.

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