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Floor Cleaning Robot with Separating Wet and Dry Waste Using Microcontroller

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ABSTRACT: In this paper, we present the design and development of a novel floor cleaning robot equipped with an advanced waste separation mechanism capable of efficiently segregating wet and dry waste during cleaning operations. The growing demand for automated cleaning solutions in both residential and commercial settings has necessitated the development of robots capable of handling diverse waste types without cross-contamination. Our proposed robot addresses this need by integrating a dual-chamber waste collection system, comprising separate compartments for wet and dry waste. The robot's control system employs machine learning algorithms to optimize cleaning patterns and adapt to varying environmental conditions, ensuring thorough cleaning performance with minimal user intervention. Additionally, the robot is designed to be user-friendly, featuring intuitive controls and a sleek, compact design for effortless maneuverability and storage. The waste separation mechanism utilizes a combination of physical barriers and automated sorting mechanisms to ensure the proper segregation of wet and dry waste materials. This segregation not only enhances the efficiency of waste disposal but also minimizes the risk of cross-contamination and ensures hygienic cleaning outcomes.

KEYWORDS: Cleaning mechanism Floor cleaning robot, Wet and dry waste separation, Cleaning schedule optimization, Wet waste recognition, Dry waste recognition etc

I.INTRODUCTION

Introducing the next evolution in home cleaning technology, The floor cleaning robot equipped with a Bluetooth-enabled app for seamless control and waste segregation. This advanced robot not only keeps your floors pristine but also efficiently separates wet and dry waste at your command through the convenience of your smartphone. Experience a new level of cleanliness and convenience in your home with this innovative solution.The concept suggests a more sophisticated design compared to traditional floor cleaning robots, which usually focus on either vacuuming or mopping. This specialized functionality could incorporate advanced sensors to detect moisture levels and differentiate between wet and dry areas, along with mechanisms for collecting and storing each type of waste separately.

In terms of operation, the robot would likely navigate the space using sensors or mapping technology to identify areas in need of cleaning. Once a cleaning zone is recognized, it would apply appropriate methods, such as vacuuming for dry waste and mopping or scrubbing for wet waste. The waste collection system would then segregate the debris into dedicated compartments for later disposal or emptying.

II. SYSTEM MODEL AND ASSUMPTIONS

Motors and Wheels These components enable the robot to move across the floor. Sensors Include obstacle detection sensors (like ultrasonic or infrared sensors) for navigating around obstacles, and surface sensors to identify wet areas.Vacuum/Suction System This system is responsible for cleaning the floor. It could consist of a vacuum motor and suction mechanism Containers Provide separate containers for storing wet and dry waste collected by the robot Power Supply.

The robot can be powered by either a rechargeable battery or an adapter for continuous operation.Chassis and Body Structure These components provide the physical framework and housing for the robot's internal components.Microcontroller Programming Develop algorithms to control the robot's movement based on input from

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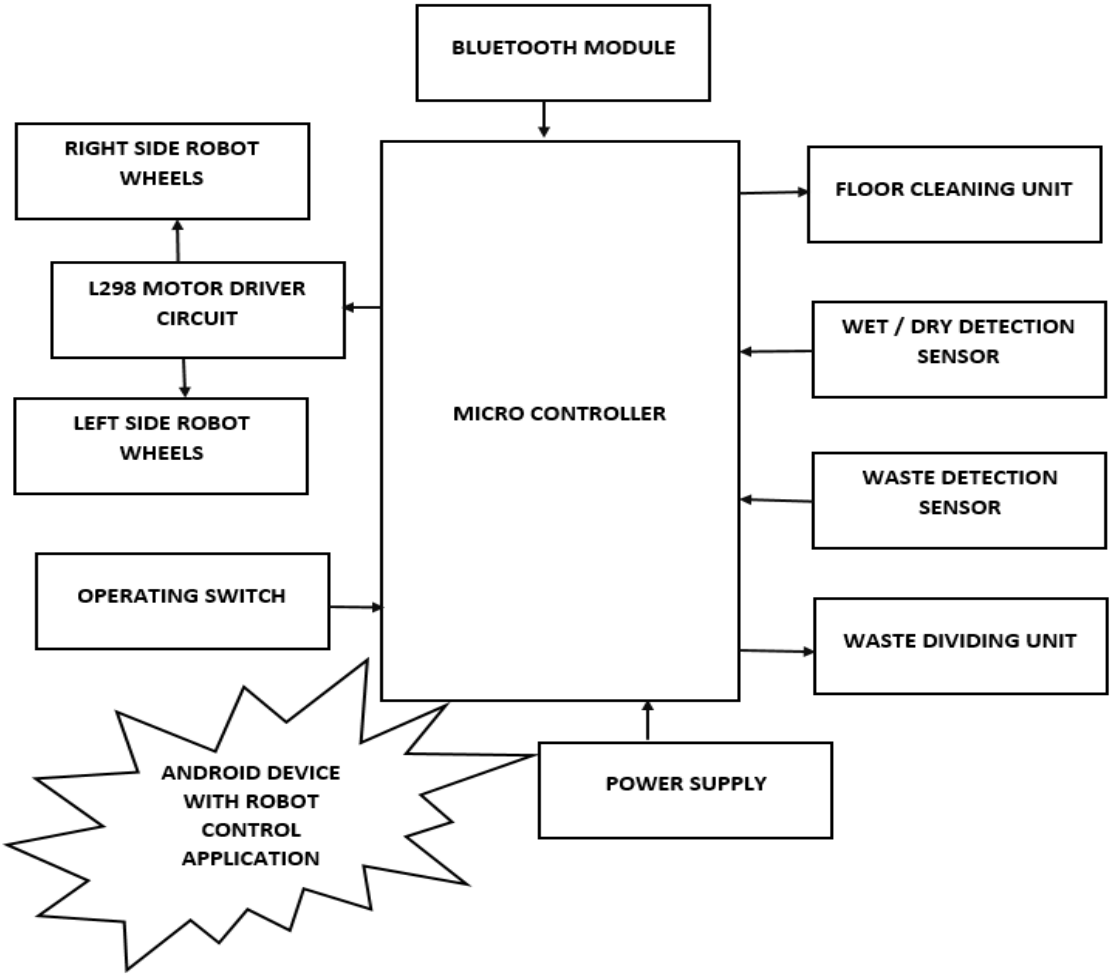
obstacle detection sensors. Implement routines to identify wet areas on the floor using surface sensors.Program the microcontroller to control the cleaning mechanism (vacuum/suction system) based on the detected surface conditions. Develop logic to manage the separation of wet and dry waste, directing each type of waste into its respective container.



Waste Separation Mechanism design a mechanism to segregate wet and dry waste collected by the robot. This could involve using different compartments or containers for each type of waste. Implement actuators controlled by the microcontroller to direct the waste into the appropriate container based on its moisture level.Safety Considerations Implement safety features such as emergency stop buttons and collision detection to prevent accidents during operation. Ensure that the robot's cleaning mechanism is designed to be safe and does not cause damage to furniture or other objects in its path.

III.METHODOLOGY

The above block diagram shows the working of the how the floor cleaning robot will work here we have used the microcontroller 8051 which is P89V51RD2 as the brain of the project.

The floor cleaning robot will work through the commands which are received from the Android device with the robot control application, once it receives the signals then according to the given command from the application The floor cleaning robot will move place tor backward and it will stop once it gets the intruder it will stops the Bluetooth module here, we are using the HC05 which is connected with the mobile device.

Here L298 motor driver circuit is used to drive the DC motors in respected directions. Operating switch is used to differentiate the weather the controller should work as the floor cleaning robot or waste segregation unit while it is

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performing the floor cleaning robot the Bluetooth device HC05 is connected with the android device and when we use that motor on or floor cleaning mop on the motor will turn on and it will cleanse the floor.

The next part included in this project is waste segregation unit here the waste segregation unit sensors are as one is for detect the waste is placed near the sensor another sensor will give the output as the west or dry waste

The waste segregation unit will segregate to Respected bins as dry Waste or wet Waste with the help of dc motor which is driven by the L298 motor driver circuit Controlled by the 8051 microcontroller P89 V51RD2 the complete project runs with the power supply of 12V DC which is given from the battery or live source.

IV.SURVEY DESCRIPTION

This survey is innovative technology aims to streamline cleaning processes in both residential and commercial settings while promoting environmental sustainability by facilitating proper waste segregation.
Current cleaning practices and challenges faced in waste segregation.
Interest and willingness to adopt automated cleaning solutions.
Preferences regarding the design, features, and usability of the floor cleaning robot.
Concerns or reservations about implementing such technology in your environment.

V.FUTURE SCOPE AND DISCUSSION

Waste Detection Sensors Integrate advanced sensors like moisture sensors or optical sensors to accurately distinguish between wet and dry waste on the floor. Ensure these sensors are sensitive and reliable in various environmental conditions.

Waste Segregation Mechanism Develop a robust and efficient mechanism to segregate collected waste into dedicated compartments for wet and dry waste. Consider implementing automatic gates or separators controlled by the microcontroller for precise waste segregation.

Cleaning Mechanism Versatility Design a versatile cleaning mechanism capable of adapting to different floor surfaces and waste types. Incorporate interchangeable brush types, adjustable suction power, and modular attachments for mopping or scrubbing.

VI. RESULT AND DISCUSSION

Microcontroller Utilize a microcontroller (such as Arduino, Raspberry Pi, etc.) as the central processing unit to control the robot's operations and integrate various sensors and actuators.

Sensors Incorporate sensors for detecting wet and dry waste on the floor. This may include moisture sensors or optical sensors to differentiate between liquid and solid waste.

Waste Segregation Mechanism Design a mechanism within the robot that segregates the collected waste into separate compartments for wet and dry waste. This could involve mechanical separators or conveyors controlled by the microcontroller.

Cleaning Mechanism Implement a robust cleaning mechanism such as brushes, vacuum suction, or mopping pads to effectively clean different types of floor surfaces.

Algorithm Develop an algorithm to process sensor data and determine the type of waste encountered by the robot. This algorithm should enable the robot to make decisions on waste segregation in real-time.

User Interface Create a user-friendly interface, which could be a physical interface with buttons and indicators or a mobile application, to allow users to monitor the robot's operation and configure cleaning settings.

Power Management Implement a power management system to optimize the robot's battery usage and ensure sufficient runtime for cleaning operations.

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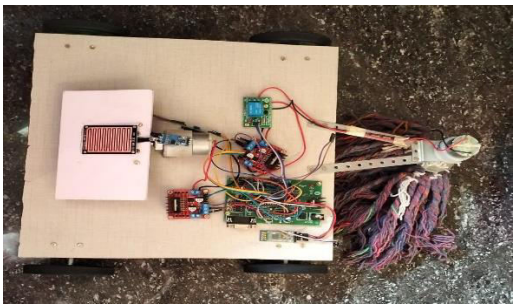

Fig. 2 System Overview Result

VII.CONCLUSION

This paper presents the design and implementation of a smart, autonomous cleaning and mopping robot. The system is powered by a rechargeable DC Lithium Polymer battery of 12V. The Arduino Mega board is selected for its ample GPIO pins and superior flash memory storage of 256 kB compared to other Arduino-based microcontrollers. The application software, developed in Android Studio, enables Bluetooth connectivity to any pairable device or component. The wireless control range extends up to 10 meters, offering sufficient range for controlling the device across a house.

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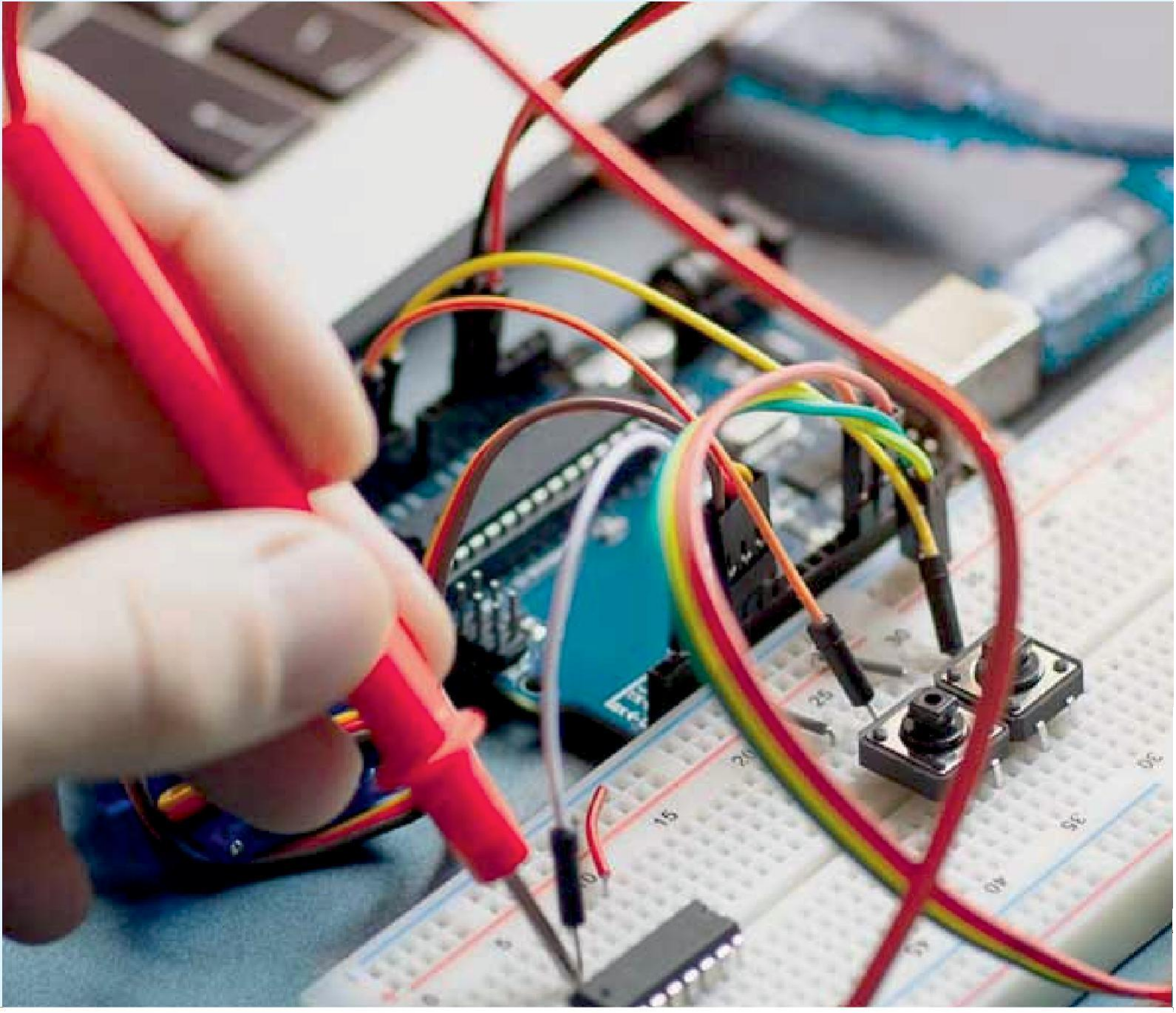

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