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ASTER: Automatic Smart Cleaning Robot

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Abstract: ***The advances in robotics technology have made life significantly easier, much simpler and comfortable. So, with the highly stabilized and rapidly functioned electronic and mechanical control system, Smart floor cleaner system enables floor cleaning effectively.***
There are numerous autonomous robots on the market, and while they all perform flawlessly according to their specifications, none of them are cost-effective. Keeping in mind the economic population of developing country like India, this robot is designed.
This project presents a cost-efficient robot which can be used by people for effective floor cleaning. While designing the robot, firstly we need to obtain a broad understanding of how this domestic service robots can be used for cleaning, and then we must focus our efforts. Consider how the robot will fit into our household. This project is about an ingenious floor cleaning a robot that can clean the floor by giving commands directives to the robot. Using a wireless robotic cleaning system, this robot makes floor cleaning simple and quick.
Keywords: IDE = Integrated Development Environment, ICSP= In Circuit Serial Programming, SoC = System on Chip, PAN = Personal Area Network, FHSS = Frequency-Hopping Spread Spectrum, USART = Universal Synchronous Asynchronous Receiver Transmitter.

I. INTRODUCTION

A smart floor cleaner is a device that cleans the floor using a highly optimized and swiftly functionalized electronic and mechanical control system. When modeling the robot, we must first understand how domestic service robots might be used for cleaning purposes, and then perhaps we can consider how the robot would work into our household. Robotics technology advances have made people's lives even more secure and convenient. This paper presents a smart floor cleaning robot that can clean floor effectively by giving the robot instructions. Using a wireless robotic cleaning machine, this robot makes floor cleaning quick and effective.

This wireless device has a transmitter programmed that runs on an Android mobile app. The User give commands to the robot through this app and the robot responds to these commands thereby completing the required floor cleaning task effectively. The primary benefit of this product is that it will be inexpensive and will not require human supervision. When turned on, it will scrub the whole room without leaving any floor untouched. People nowadays are more career-oriented and live in a fast-paced setting. So, to save them time and make their lives a little easier, a robot is programmed that does not involve human interaction until turned on.

II. LITERATURE SURVEY

1) Design of cleaner using Android voice-controlled Robot by Dr. Ms. K.N. Kasat and Zeeshan I. Sheikh from Prof Ram Meghe college of Engineering & management Bandra, Mumbai. The cleaning of robots can be controlled by voice or remote controlled. This automatic floor cleaning device has micro controller which runs to clean the floor. A remote-controlled car has gear motor with cleaning brush at front, is attached at front axis in between the front wheels. The gear motor is connected to 12 volts battery and the remote car is attached to 9 volts battery. The remote car is controlled by the microcontroller.

2) Sweepy: The smart floor cleaner by Lavanya V, Meghana K, Rohan P S, Sneha R. This paper proposes a system which can be used for daily household cleaning purposes. By two modes i.e. dry and wet modes all round cleanliness is achieved. Hence good health and hygiene is achieved. The robot works in two modes- automatic mode and manual mode. Use of IMU motion sensor for motion and orientation information allows accurate measurement of position and of uneven surfaces. This helps in cleaning flat surface with the ease of remote control with greater work efficiency. There are many functions to have co-ordination for the motion control. Arduino controls all hardware and software operations. The project aim is to develop and modernized process for cleaning the floor which can detect obstacles on dry as well as wet surfaces.

3) Robotic Vacuum cleaner using Arduino with Wi-Fi by J. B. Jarande, S. P. Murarkar, N. S. Vast, N.P. Ubhale, S.S. Saraf. The idea is inspired by famous vacuum cleaner “Roomba”. Arduino is the main processing unit of robot and operated using Wi-Fi. It works on principle of IoT. Results showed that it can be operated for domestic and publics places as well.

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4) The social impact of a Systematic floor cleaner by Kristen Culp, Paola pirjanian. Mint is an automatic floor cleaner which sweeps and mops hard-surface floors using mopping cloths. The cloth is attached by the user to a removable cleaning pad at the front of the robot. The product was introduced in 2010, the feedback has been overwhelmingly positive. Mint reached customer review, 4.5 out of 5 stars on internet shopping sites such as Amazon and other web sites of retail stores in the U.S. like Bed Bath & Beyond or Walmart.

III. PROPOSED SYSTEM

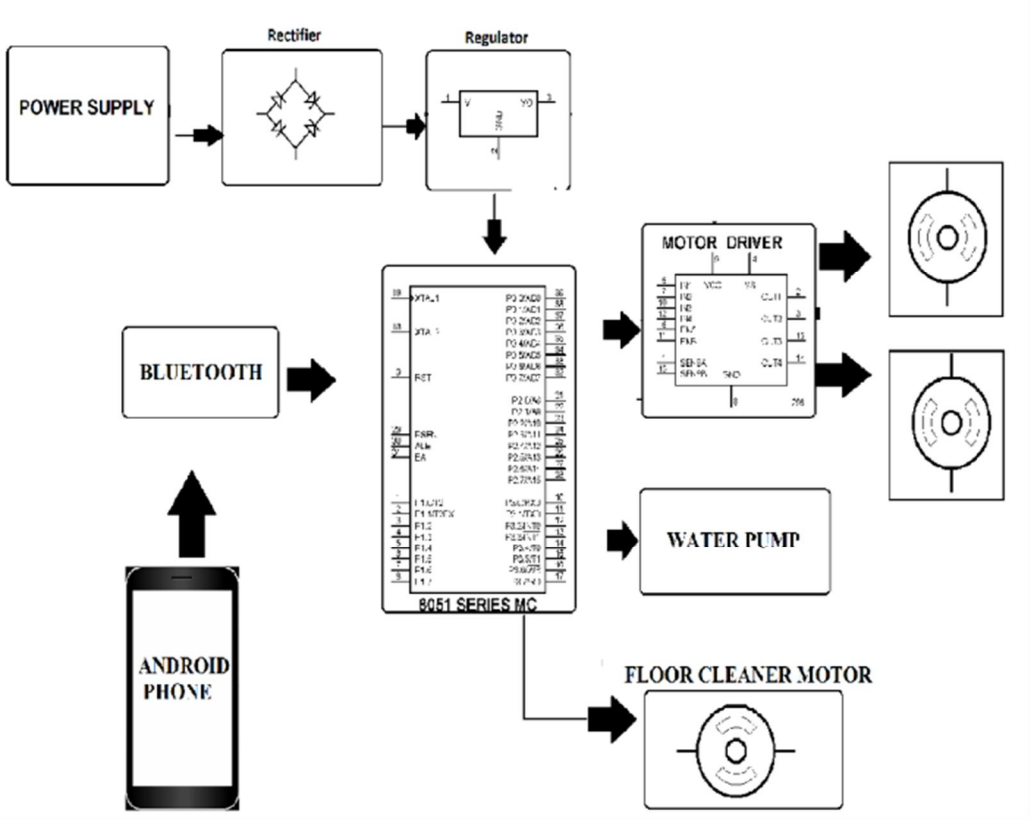


Figure 1: Block Diagram

The Block Diagram consists of Arduino UNO as main functional unit of the system, along with Motor drivers L298N, Bluetooth module HC05 and power supply. Android application is used to give commands to the robot. For effective floor cleaning process, water pump and two mobs are used. Bluetooth module HC05 is connected to Arduino UNO which helps the user to connect with the robot.

IV. WORKING

For smart floor cleaning, Robot needs mechanical arrangement of chassis. Arrange the chassis and connect the two wheels of the robotic vehicle to the motors which are in turn connected to the microcontroller. For mechanical arrangement we used Motor driver IC (L293N), dc Motors, wheels because the output of the microcontroller is maximum 5V only which cannot drive dc motor hence we used motor driver module which amplify voltage up to 36V. Four DC motors are used for the four wheels and one Dc motor is used for pumping.

Two gear motors are used for scrubbing and mobbing purpose which are attached to front and the back. Then, we had used four Ultrasonic sensors for object detection. In our robot we are using four ultrasonic sensors in which three ultrasonic sensors are placed on left, Right and front part of the Robot and if an object detects by the robot, it changes its route according to the condition of the algorithm. The fourth ultrasonic sensor is used at bottom of front part which is used for stairs detection and then move backward. It is controlled by Bluetooth module and Wi-Fi module. It works in both manual and automatic modes.

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V. FLOWCHART

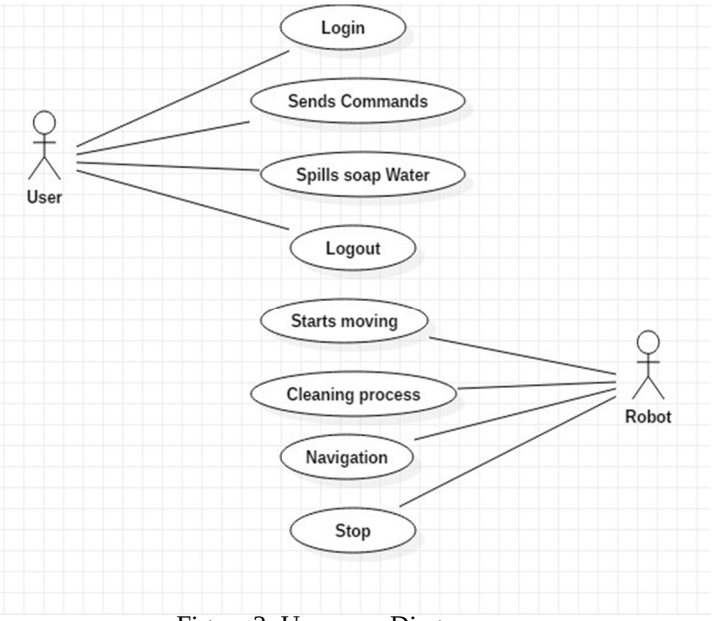


Figure 2: User case Diagram



Figure 3: Flow chart

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VI. RESULTS

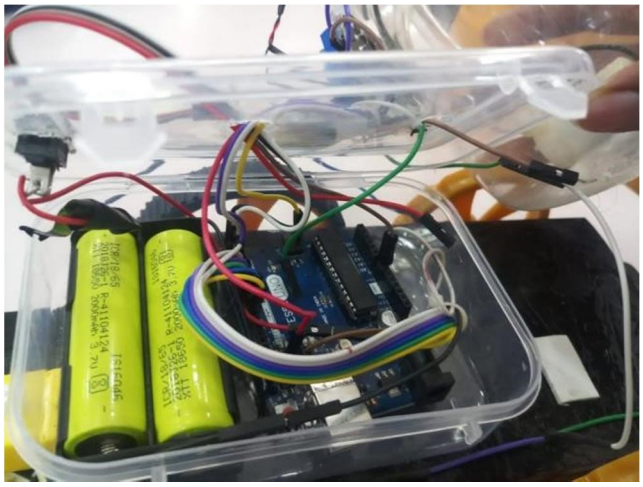


Figure 4: Main functional Unit of Robot



Figure 5: Floor cleaning mechanism



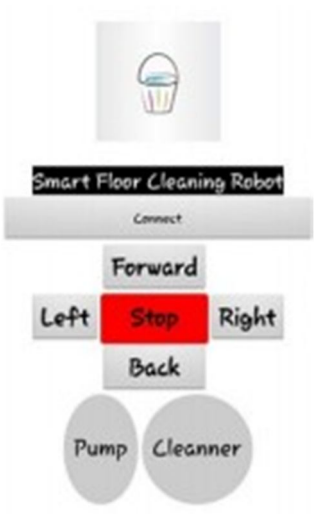


Figure 6: Water tank Figure 7: Control Panel of Android application

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Figure 8: ASTER Robot

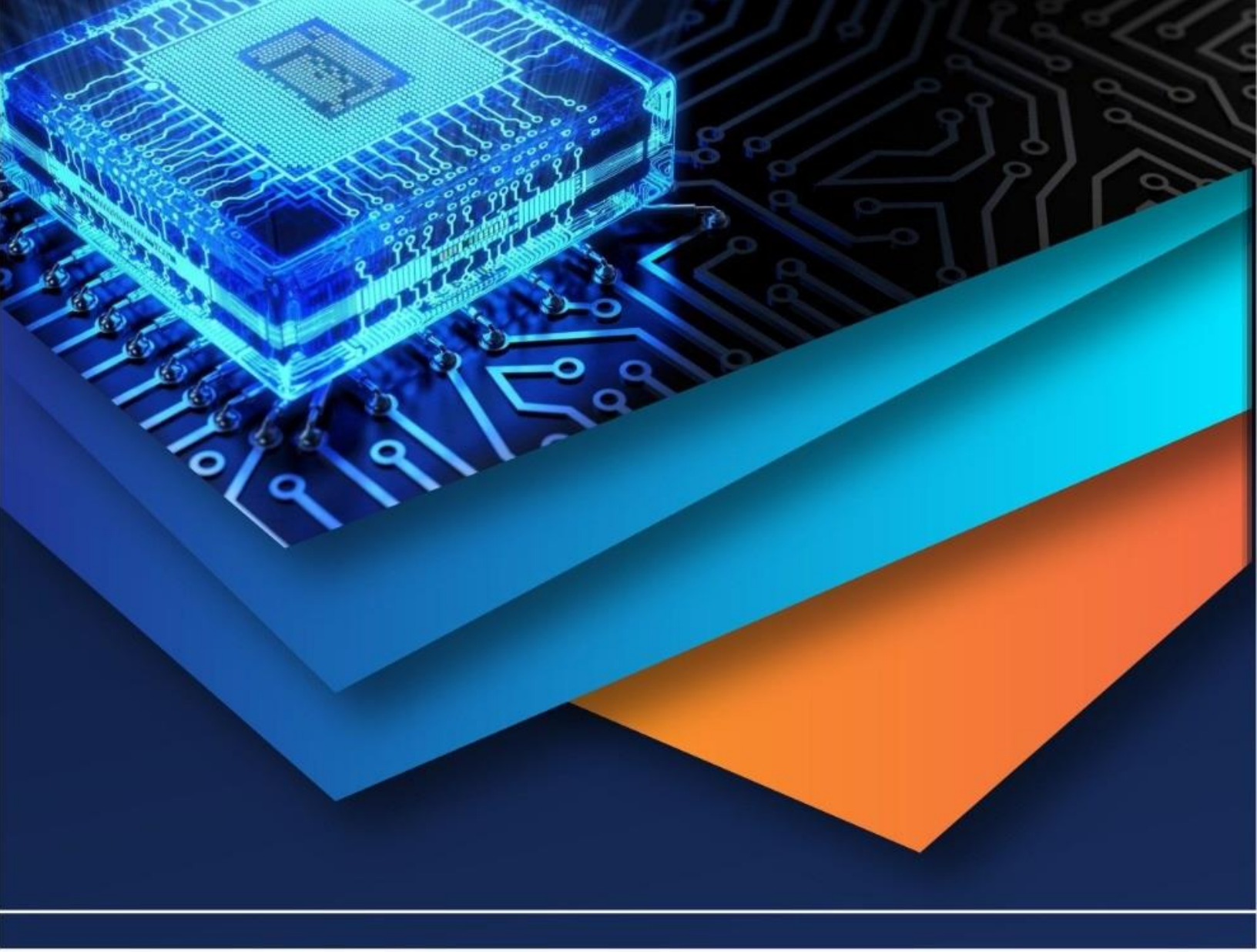
VII. CONCLUSION

The use of advanced technologies not only decreases costs but also reduces human work while increasing floor cleaning effectiveness. The proposed project is an android-based automatic floor cleaning system. The machine can function without using a lot of human physical resources. Reduced human effort results in more regular floor washing, which improves general cleanliness and promotes safe well-being. The floor cleaner is fitted with various equipment such as DC motor(s), ultrasonic sensors, and so on. It is convenient to use and saves time by cleaning at homes and workplaces automatically.

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