Review Paper on Electrical Drive Based Floor Cleaning Robot

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Abstract – *Industrial as well as commercial robotics systems are common nowadays. However, electric drive based floor cleaning robot that provides cleaning as well as mopping functions, while being autonomous as well as remote-controlled, also it is quite expensive. This paper presents the design and implementation of electric drive based floor cleaning robot with an Android-based or Bluetooth based controller. The implementation is based on an Arduino Uno microcontroller and dc electrical motor. Also this system based on android based application which is secure and easy to use the user. The Android application features a secure user login system and we can connect this system to the electrical drive based floor cleaning robot through Bluetooth. It can be used to control the system motion to guide it in a specific direction to cleaning the floor and also mopping this floor. The user has complete control over the robot either in the autonomous as well as remote-controlled mode. This system consists of five main blocks namely the power block (Dc battery), the motor system (driving wheels, rotating brush, vacuum fan, water pump), for communication block (Bluetooth control, HC 06 Bluetooth module) and for control software block (Android remote controlled).The implementation and testing of this system, it was observed that the robot works as on programmed, and is operational with most of the functionalities of a domestic commercial state-of-art electrical drive based floor cleaning robot.*

Key words **– Arduino, Bluetooth, Drive, Ultrasonic Sensor, floor.**

1. INTRODUCTION

Cleanliness is the action of make the environment clean, beautiful, green and comfortable. Cleanliness is not only in one place this is an everywhere i.e. cleanliness of the office, home, hotels temple and school and also where we daily live. Cleanliness is an indivisible part of human life and this is directly connects to the human health. Cleanliness is a precondition for the realization of health, a clean environment will provide great benefits to humans and on the other hand a dirty environment will give people big problems was studied.

The job of cleaning the floor of a room may appear very simple, but actually lot of time and energy consume a process. Limitations of humans and lifestyles of humans that do not care about the cleanliness of the surrounding atmosphere, as well as technical limitations that may be a factor for people do not attention on that. Therefore, researchers are new to make simple system that can help the cleaning workers to clean floors. Researchers want to develop technology while maintaining cleanliness and keeping a side by a side of technologies that are currently developing in this new modern life. Therefore, the researcher wants to make equipment design that can clean a room by cleaning the floor automatically as well as manually accordingly to customer requirement. By using well-known component, namely the Arduino Uno as the microcontroller, DC motor as the driving force, this is because the electronically controlled equipment provides more ease in its use was studied by this research. Then electrical drive based floor cleaning robot was designed using many sensor was studied. This device can be an alternative to helping the public or cleaning workers to clean floors which is done automatically or manually.

2. RELATED WORK

This Section describes the previous works on implementation technology to electrical drive based floor cleaning robot on different technologies designed by other researchers around the world.

Yuda Irawan, "Automatic Floor Cleaning Robot Using Arduino And Ultrasonic Sensor" , Journal of Robotics And Control (JRC) , 2021. In this paper Focused on proposed model which the floor cleaning robot prototype will automatically run in the direction that no one is blocking it.

Pawan Kumar Ramkisssoon , "A Smart Autonomous Floor Cleaner With an Android Based Controller", IEEE 2020. The design and implementation of electrical drive based floor cleaning robot with both mopping and vacuuming technique used.

Rizuwana Parween, "Autonomous Self-reconfigurable Floor Cleaning Robot", IEEE, 2020. The implementation of the optimal design of the cleaning module, designing of the wheel for reducing the slip.

2.1 PROBLEM STATEMENT

The cleaning capacity is limited by the small size of the dustbin which is used in this system. This can be increased proportionately. Also, a bigger impeller with more clearance space between the blade and the exterior are sensible as this affects the positioning and retrieval of the dustbin. The Motor shield is driven by two L293D IC; these components may become more and more heated when they are in operation thus merger of heat-sink or more conventional cooling system will be beneficial. There is a need for more sensors for large scale household ability, for instance, a cliff sensor incase of stairs when this equipment works on stairs. Finally, a docking station where the robot can renew itself once its battery is drained needed to be in commercial for complete automation.
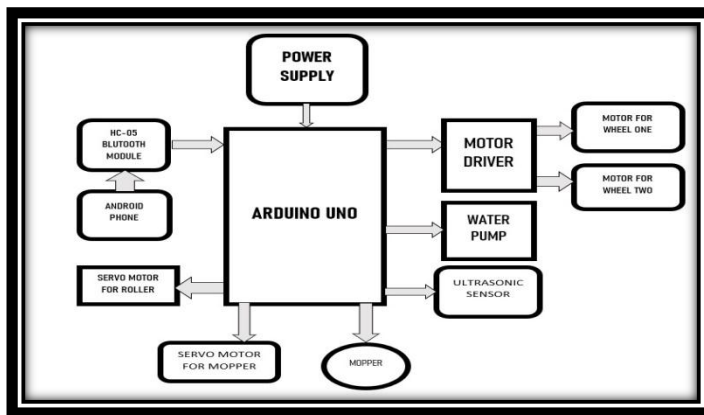
3. BLOCK DIAGRAM

Fig. 1 Block Diagram of Electrical Drive Based Floor Cleaning Robot.

3.1 HARDWARE REQUIREMENT

The hardware requirements are followed;

(1) Arduino Nano - The easiest to use is the Arduino Mega board, which contains the ATMega3560, and can be programmed over USB from the Arduino software. There are   GPIO pins which are mapped internally to the peripherals like SPI, USART, and SPI.

(2) Ultrasonic Sensor - The sensor head emits an ultrasonic wave and measures the distance to the wall, through the reflected wave back to the head. The distance measurement occurs by measuring the time between emission.

(3) HC-06 Bluetooth module- HC-06 Bluetooth module acts as a medium of connection between the Android application and the floor cleaner robot. The maximum

detection range is 10 m, which is sufficient for a house. The Bluetooth module works with an input voltage of 5 V. It receives a value of character type from the Android phone through the receiver pin and then passes on the value to the Arduino board through the transmitter pin where the MEGA board uses the received character to execute a function.

(4) Infrared sensor- The infrared (IR) sensor has more or less the same working principles as the Ultrasonic but instead of emitting ultrasonic waves, it emits and receives infrared radiation. These obstacle sensors come as Light Emitting Diodes (LED) compatible with Arduino boards and they can emit rays from 700 nm to 1 mm wavelength. A knob is usually rotated on the sensor in order to reduce or increase the obstacle detection distance.

(5) Cliff Sensor- Cliff sensor is required to prevent any fall and damage of the cleaner. Thus, a sharp GP2Y0A21YKOF distance sensor is used to measure the distance of 10 cm to 80 cm vertically downwards. The sharp sensor acts as an infrared sensor by using a beam of infrared light to reflect off an object so as to measure the distance in between. The sharp sensor is a better IR sensor as it is unaffected by any temperature change and gives reliable and accurate readings.

3.2 WORKING

The electrical drive based floor cleaning robot system consists of various types of sensors, all around and below the robot chassis. These sensors include one ultrasonic sensor and three infrared sensors that guide the robot for collision avoidance. A sharp cliff sensor is also included to prevent the robot from falling, for example off the stairs. All these sensors are connected to an AT MEGA 2560 microcontroller (Arduino MEGA) which is pre-programmed to execute the required for the cleaning process; a dc brushless vacuum fan is used to blow all the dirt into the dirt container. Whereas for mopping, dc water pump is used to pump water at frequent intervals to a mop cloth. The whole robotic system is powered by a rechargeable battery of 12 V Lithium Ion. An android application is used either to control the floor cleaner or to put it in autonomous mode. This enables the user to have the flexibility of operating the robot from a distance of about 10m. After the cleaning process, the dirt container is emptied, and the mop cloth is replaced. The garbage collection from the vacuum pump will be an automatic process. Clean the mop in weakly one time by manual process.

4. SURVEY

Table 1 – Bluetooth and action performed in the system

Button	Action
Turn ON autonomous	Turns on autonomous mode
Logout	Logs out of application
Bluetooth Connect	Connect via Bluetooth to the robot
Bluetooth Disconnect	Disconnect Bluetooth connection
Forward	Makes the robot move forward
Right	Makes the robot move to right
Left	Makes the robot move to left
Stop	Makes the robot move to a half
Backward	Makes the robot move backward

5. ADVANTAGES AND LIMITATIONS

Advantages –

1. Robotic vacuum cleaners clean without human Interference.

2. You can clean your home when you are away from home.

3. Perform best on hard floors.

4. Can clean underneath of furniture.

5. Robotic vacuum cleaners save time.

6. Require only weekly maintenances

Limitations –

Robotic vacuum cleaners cannot clean stairs. Expensive compared to other models like canisters, upright, handheld. Perform average on soft floors and carpets.

6. CONCLUSION

An cleaner robot that that may perform dry cleaning as well as wet cleaning. This may be operated in automatic mode have same additional feature like scheduling for specific time and dirt container with auto dirt mechanism. This device may versatile and cost efficient than existence systems. This may be design for the handicapped people having mobility issues for cleaning purpose without any external help. This may be used in industries and other commercial purpose to save the time and also to enhance the lifestyle.

REFERENCES

[1] Yuda Irawan, "Automatic Floor Cleaning Robot Using Arduino And Ultrasonic Sensor" , Journal Of Robotics And Control (JRC) , 2021.

[2] Pawan Kumar Ramkisssoon , "A Smart Autonomous Floor Cleaner With An Android Based Controller", IEEE, 2020.

[3] Rizuwana Parween, "Autonomous Self-reconfigurable Floor Cleaning Robot", IEEE, 2020.

[4] Goon, L. H., Isa, Othman, "Development Of Simple Automatic Floor Polisher Robot Using Arduino", International Journal Of Engineering Creativity And Innovation, 2019.

[5] Toshika Johri, "Automatic Cleaner Robot", International Engineering Research Journal (IERJ), 2017.