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Electrical Drive Based Floor Cleaning Robot

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Abstract : *Industrial, commercial, and residential robotics systems are common nowadays. However, an electric drive-based floor cleaning robot that provides cleaning as well as mopping works, while being automatic as well as remote controlled, also it is moderately expensive. This paper presents the Structure and implementation of an electric drive-based floor-cleaning robot with an Android-based or Bluetooth-based controller. This system is based on an Arduino Uno microcontroller and dc electrical motor and also depend on various sensor. Also, this system is based on an android based application that is secure and easy to use for the user. We can use an application-based system that is secure for the login that is connected to the Bluetooth system. It can be used to control the system motion to guide it in a specific direction to clean the floor and also mop this floor. The user has complete control over the system either in the autonomous or remote-controlled mode. This system consists of six 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), Water tank place where we store the water for this system. During the implementation and testing of this system, it was observed that the robot works as on program, and is operational with most of the functionalities of a domestic commercial state-of-art electrical drive-based floor cleaning robot.*

Keywords - *Arduino, Bluetooth, Drive, Ultrasonic Sensor, BLDC Motor Fan.*

I. 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 places like office, home, hotels temple and school and also where we daily live. Cleanliness is an indivisible part of human life and this is directly connecting 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. We can make a new simple system that can help the cleaning workers to clean floors in the industries as well as social places. We want to develop technology while maintaining cleanliness and keeping a side by a side of technologies that are currently develop in this modern life. Therefore, to make equipment project that can clean a room by cleaning the floor automatically or 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. Accordingly, to the requirement of the user make and the system which based suitable to the user. Making the system consider location and other parameter for location is made for industry, home and hospital area etc.

II.   LITERATURE REVIEW

Recent days there are more number of electrical drive based floor cleaning Robot system in the market. All these robots are based on the technical analysis of research work published in some of the papers described below.

[1] Manreet Kaur in the paper "Design and development of floor cleaning robot" have made the cleaning using automatic as well as manual modes. They have used radio frequency modules for wireless communication between remote and robot having range of 50m. In the automatic mode, robot controls all operations itself and changes the lane in case of obstacle detection and moves to other side where obstacle is not find. In the manual mode remote is used to perform the predictable task and to operate the system. There is one drawback in this system this module has no capability of self-charging.

[2] The another paper which was published by Jens Steffen Gutmann, Kristen Culp, Mario E. Munich, Paolo Pirjanian in the paper "Social impact of a systematic floor cleaner" explain perfect cleaning robot which is an automatic cleaning robot that sweeps as well as mops solid surface floors using brushing and moping cloth was developed. It examines the product's social impression with respect to the attitude of customers towards a systematic floor cleaner and how much a robot influences a lifestyle. Efficient cleaning was an important feature and modifications to the environment to support the direction-finding of the robot. The robot employs an efficient cleaning strategy that maps the environment using GPS like indoor localization.

[3] Other paper is published by J.Y. Sung, R. E. Grinter "Housewives domestic robot technology international journal of social robotics". In this paper a new type of homebased intelligent cleaner system adopted the ultrasonic and IR sensor has ability to function of real time environment awareness is introduced and the cleaner system is driven by stepper motor has the ability of autonomous working by itself and the functions of automatic detection and hurdle avoidance.

III.   PROBLEM IDENTIFICATION

The volume capacity of the dustbin is limited. This can be scaled up respectively. Also, a bigger impeller with more allowance space between the blade and the casing is sensible as this disturbs the positioning and retrieval of the dustbin. The motor continuously rotates so components connected to the motor may become increasingly heated in operation thus in case continuously operation we require heat sink or other components like heat sink. There is a requirement for a more sensors for a large scale domestic capability, for instance, a cliff sensor in case of stairs. Finally, a docking station where the robot can recharge itself once its battery is drained needed to be in corporate for complete automation.

IV.   METHODOLOGY

4.1 Working

The automatic floor cleaner is intelligently programmed to clean a specific area through a vacuum cleaning assembly. The cleaner is cost effective, convenient, environment friendly that saves the valuable time of any person. The vacuum cleaner is made on a circular piece of board that has wheel beneath it and brushes attached at its side in order to collect the dirt as it passes over the surface. DC motor is used to change direction of wheels which is connected to the platform. If the enough current is produced, then DC motors can be operated directly otherwise a motor driver is required so as to provide it a high current i.e. up to 0.7 to 1.2 ampere. Driver Used is named as L293D with H-Bridge Configuration. The cleaner is handy and can spin anywhere in any direction. Sensors are basically used to set up a communication link between the outside world and the digital device and to fulfil the purpose use two Ultrasonic Sensors (HC-SR04) are incorporated in the project. One of it is used to detect the obstacles or hurdles in front of the cleaner so it moves back and change its path or lane and the other is used to detect the height in order to prevent the cleaner from falling down A self-build suction unit is attached to the brushless DC motor rotating at a very high speed. It sucks in the dirt as soon as it is turned on. It can be detached and the dirt can be removed from it.
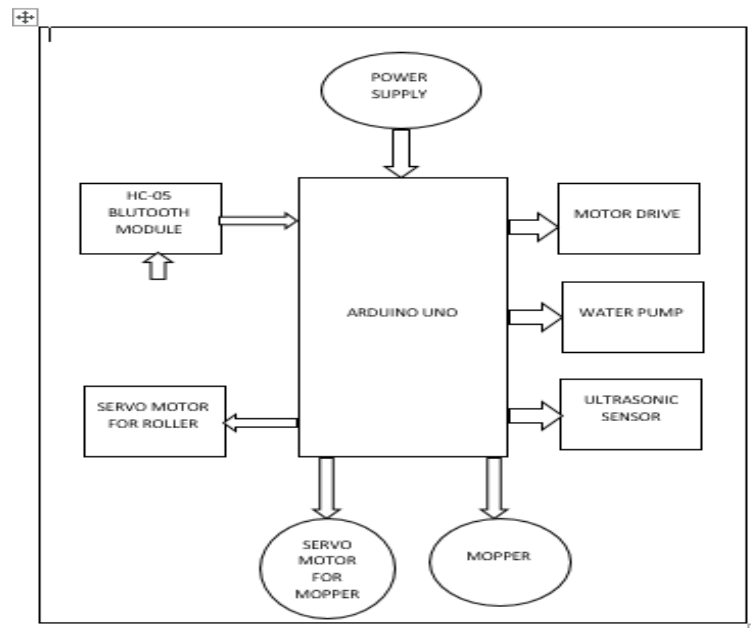
4.2 Block Diagram

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

Circuit design is of tools used to build an automatic floor cleaning robot prototype using Arduino and ultrasonic sensors.

1. Arduino Uno Microcontroller Circuit with Ultrasonic and Servo Sensors is used. Function of ultrasonic sensor is detecting the distance which is connected to the Arduino Uno Microcontroller so that the distance can block the system and the Servo functions as a motion controller with the Arduino Uno Microcontroller to help move the ultrasonic sensor to sense the obstacle.
2. Arduino Microcontroller Circuit with DC motor. This DC motor functions like robot driver which is connected to the Arduino Uno Microcontroller so that it can run the System and mop automatically and the Motor driver functions as a motion regulator connected to the Arduino Uno Microcontroller in order to regulate the motion of the dc motor was studied.
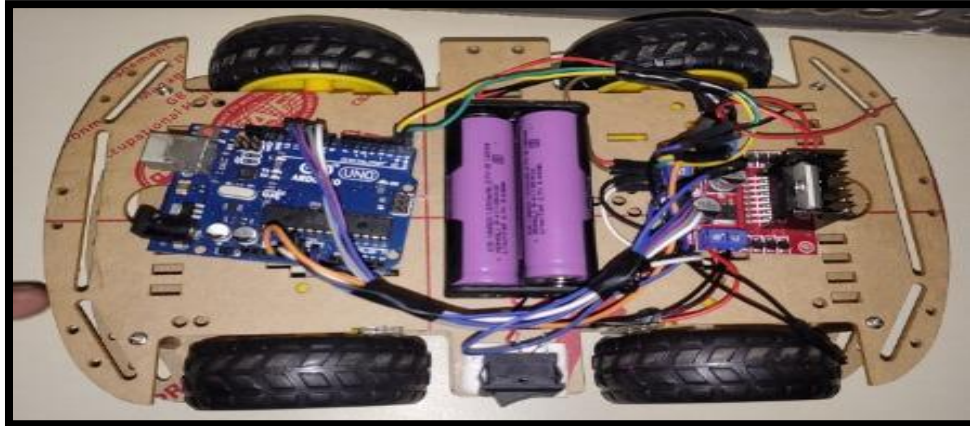
IV.3 Figure

Fig.2: Initial working model

Fig.3: Actual Model

V.   CONCLUSION

The Based on the results of the analysis, design and implementation that has been done. So, some conclusions can be drawn, namely the automatic floor cleaning robot prototype is quite effective in helping the community or cleaning workers to clean floors was studied. Build an automatic floor cleaning robot prototype using the Arduino Uno Microcontroller as a data processor and an ultrasonic sensor as a distance controller which when someone blocks it, the floor cleaning robot prototype will automatically run in the direction that no one is blocking it.

Acknowledgements

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