Automatic Smart Floor Cleaning Robot Using Arduino - UNO

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Abstract—In this paper we propose a smart floor cleaning robot that can clean the floor according to the instructions given by user. This robot makes the cleaning process fast and efficient as it receives the commands from smart phone wirelessly through Bluetooth module embedded on it. On getting the commands the robot perform functions like moving in different directions and mopping the floor. This system proves to be cost effective, low maintenance and reduced human effort which makes it a very reliable product.

Key Words: Bluetooth Controlled, Wireless, Cleaning robot, Android Phone, Low Cost, Reliable.

I.   INTRODUCTION

Cleaning robots are used in domestic and industrial environment .The floor cleaner available in the market requires a lot of human efforts and assistance. Manually cleaning may not wipe off the dust properly as some dust particles may remain on the floor and it can affect the human health adversely. This problem gives a fantastic idea to engineers and researchers to design a robot that can be a helping hand in this work.

The smart floor cleaning robot using Arduino is designed using embedded technology. The wireless communication is implemented using Bluetooth to communicate with the robot via android application [1]. The electronic circuitry of the robot consists of the HC-05 Bluetooth module which sends the command to the microcontroller Arduino – UNO on which the software program is directly loaded. L293D chips are used as motor drivers for controlled movement of robot and moppers.

II.   LITERATURE REVIEW

A smart floor cleaner is an electronic device that is intelligently programed to clean a specific area using Arduino based technology. Some features that are seen in smart floor cleaners include wet and dry mopping, vaccum cleaning, detection of obstacles, security cameras and UV sterilization. Some of the Smart Floor Cleaners available are:

A. CLEAR [6] operates on dual modes i.e. automatic and manual. In automatic mode, decision is made on the basis of outputs of sensors being processed by Arduino and control actuators by H-Bridge driving circuitry. In manual mode, robot cleans the particular area of room by using laptop with GUI in Visual Studio via. Bluetooth Connectivity.

B. Vito M guardi [3] developed an android application for a robot driven by a microcontroller. His idea of The idea of his work is to show that android app can be operated using totally different electronic devices. He also invented a communication protocol for android smartphone and robot using Bluetooth.

III.   HARDWARE DESIGN

Design Overview: The proposed model is divided into four sections namely: Robotic Car, Bluetooth Module, Water Pump and Moppers.
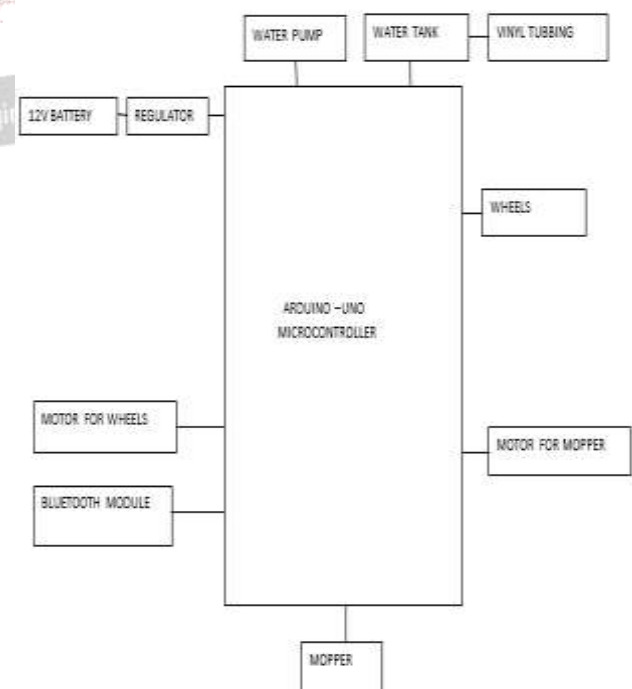

Fig. 1 BLOCK DIAGRAM

The robotic car moves in four desired directions as per the command given by the user. The Bluetooth module controls

the robot wirelessly using smartphone application within a specified range. There is also a water pump and water reservoir which can be switched on when required to throw water on the floor and make the mops moist for a proper clean. The rotating moppers absorb the sprinkled water on the floor and therefore completing the cleansing process.

HARDWARE SPECIFICATIONS

i. Arduino - UNO : The Arduino board is equipped with sets of digital and analog Input– Output (I/O) pins. These pins also include Tx and Rx pins which helps in serial communication with Bluetooth module. It is powered through 9V rechargeable battery. The operating voltage of Arduino -UNO is 5-12 V.
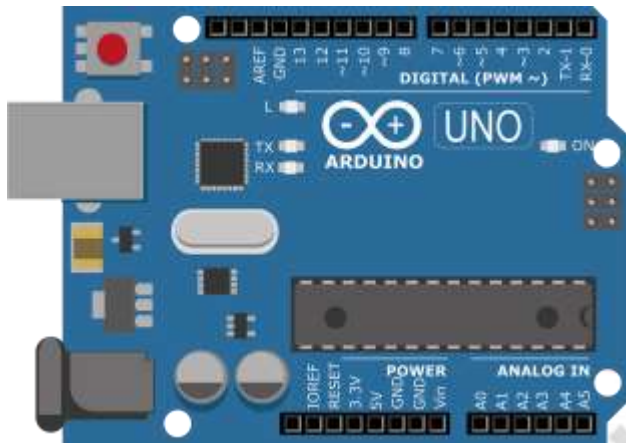
ii. Bluetooth Module: The HC-05 Bluetooth module is used for serial communication between robot and Android application. The module communicates with the help of USART at 9600 baud rate. The Operating Voltage is 4V to 6V (Typically +5V), Operating Current is 30mA and Range is less than 100 m . [7]
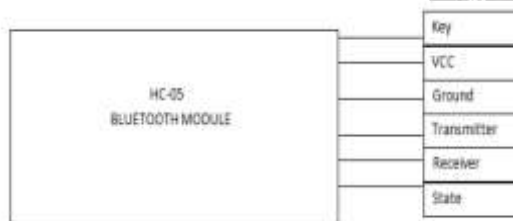
iii. Motor Driver: L293D is used as motor driver IC typically known as H-Bridge which allows the tyres of robot to move in different directions and also provides rotating movement to moppers. The input conditions of high and low are given from the Arduino to the input pins of the H bridge and from the output pins of the motor driver the DC motors will be controlled.


iv. Submersible Water Pump: It is used to push water to the surface via vinyl tubing. For proper working of this pump, motor should be completely submerged in water.[2]
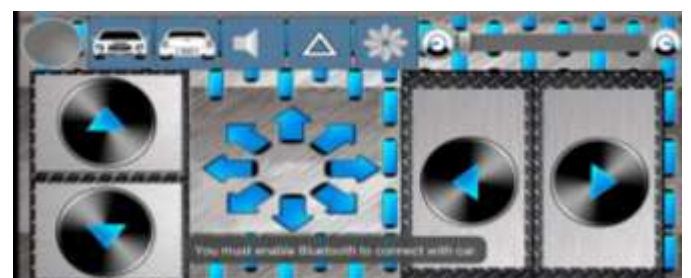

v. Lead-Acid Battery: The robot is powered via 12V battery which is ideal voltage for motors. Arduino is powered 9V by converting 12V to 9V through LM7809 IC.
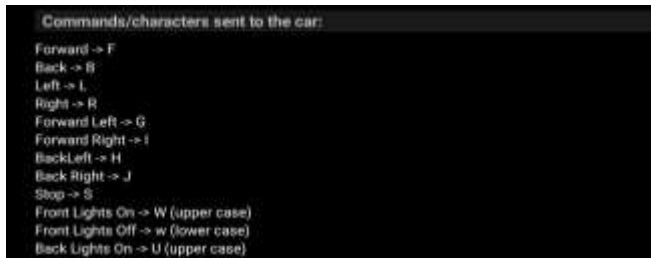
IV.   SOFTWARE IMPLEMENTATION

Arduino Integrated Development Environment (IDE) is used to write and upload program on Arduino AT Mega 328 chip [5].
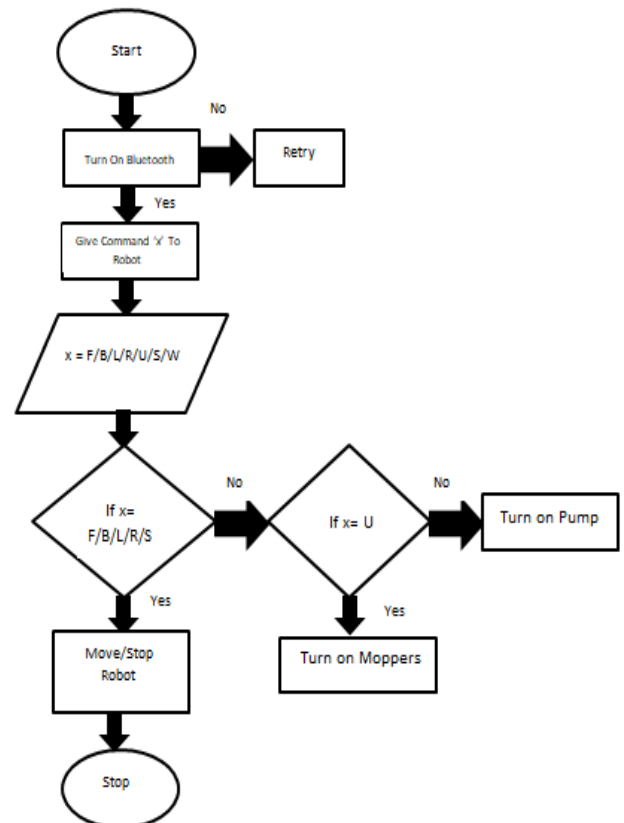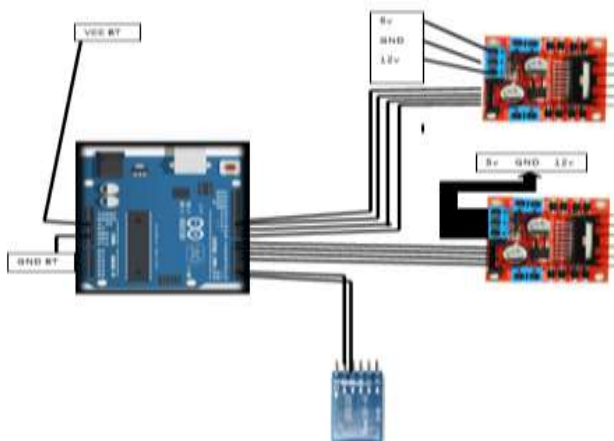

This application is used in smartphone to transmit the commands by Bluetooth connectivity with the Robot:

Following are the commands sent to robotic car through mobile application:

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Commands/characters sent to the car:

Forward -> F
Back -> B
Left -> L
Right -> R
Forward Left -> G
Forward Right -> I
BackLeft -> H
Back Right -> J
Stop -> S
Front Lights On -> W (upper case)
Front Lights Off -> w (lower case)
Back Lights On -> U (upper case)
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V.   CIRCUIT DIAGRAM

VI.   RESULTS

We have designed and implemented an automatic smart floor cleaning robot using embedded technology. It is an effective solution with simple approach utilizing local resources while making it available in an affordable amount. The Risk Factor for this Robot is very Minimum since the water pathway is separately made so it does not Coincide with the Electronic circuitry. Also the robot does not uses high voltage thereby reducing threat and making it more user friendly. It is of great usage to Aged Citizens.

The key features of the robot include low maintenance, low cost , efficient rechargeable battery and less human assistance is required.

VII.   CONCLUSIONS

The Wireless control is one of the most important basic needs for all the people all over the world. Most of the wirelessly controlled robot uses RF module but this robot uses android mobile phone connected using Bluetooth which is cheap and easily available. All the components used in the project are easily available in the market at a reasonable cost. User can easily move the robot in desired direction using the android application in their smartphone. It uses less voltage for its functioning thereby reducing threat and has a rechargeable battery of 12V.

The effectiveness of the Robot can be increased by using sensors and applying Algorithms, so that it can detect obstacles and turns into other directions without human Assistance. The Bluetooth Module HC -12 Can be used instead of HC-05 to increase the wireless communication rate. More techniques of Reducing cost of the Robot can be considered.

VIII.   FUTURE SCOPE

The features of the robot can be enhanced by adding few extra features to it like: Obstacle Detection using Ultra-Sonic Sensors, Addition of Vaccum Cleaner to suck the dust particles, Algorithms for controlling the speed of robot and adding Cameras for scanning the area for efficient cleaning of surface.

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