FLOOR CLEANING ROBOT WITH DUAL ROTATING BRUSHES AND ANDROID APP BASED CONTROL

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Abstract : Households of today are becoming smarter and more automated. Home automation delivers convenience and creates more time for people. Domestic robots are entering the homes and people's daily lives, but it is yet a relatively new and immature market. However, a growth is predicted and the adoption of domestic robots is evolving. In this proposed system, we have designed a Bluetooth based Wireless Floor Cleaning Robot with Dual Brush cleaning mechanism**.**

IndexTerms **- Microcontroller, Bluetooth module, Motor driver, Relay, LCD Screen.**

I. INTRODUCTION

Robot is an intelligent device having its own brain fed with computer logic so that it can do the work according to the algorithm designed. Autonomous movement of vehicle is guided by the logic controller designed. Robots plays an important role in each every field of life. It is used in industries, in households and in institutes. The robots are just becoming as intelligent as human now a days. Mostly an average human uses 2-3 robots per day in his day to day life.

Mechanical control devices are used to control the flow or movement of materials or any other parts present in the device. Actuators are used for controlling a mechanism which ultimately controls a part of the device. Microcontroller is the brain of robot where program is written and sensors are connected as input and actuators as output. The controlling of the robot is governed by various algorithms like fuzzy controller, machine learning based practices and artificial neural network based algorithms. Depending upon the environment value received to the controller it eliminates the error and transits from one state to another.

The research and development of an autonomous mobile robot and a Manual Phone Application Control prototype able to clean a room or even an entire house is not a trivial challenge. These robots operate semi- or fully autonomously to perform services useful to the well-being of humans and equipment. With the aim of keeping our robot as simple as possible, while able to perform the initial goals, i.e. an autonomous vacuum cleaner robot able to randomly navigate through a room or a house with the minimum human assistance.

In this proposed system, we have designed a Bluetooth based Wireless Floor Cleaning Robot with Dual Brush cleaning mechanism. The system uses batteries to power the vehicle movement motors as well as the floor cleaning motor. We use a Battery Charger to charge this battery. The Floor cleaning Motor and vehicle motors are interfaced to a AVR microcontroller unit that controls the working of all the motors. Motor driver is used to drive DC geared Motors. Bluetooth Module is used for Wireless Connectivity between Android Phone and Floor Cleaning Vehicle.

To control the Movement of the Robot, Bluetooth Technology is used. User has to connect this Robot using Bluetooth based Android Application. Communication between the robot and user is done using RF2.4ghZ Frequency. We can control the Robot Movement Left / Right / Forward / Backward / Cleaning Brush-Control using this Application. Using this feature, user can clean any corner of the floor using this Application

II.BLOCK DIAGRAM

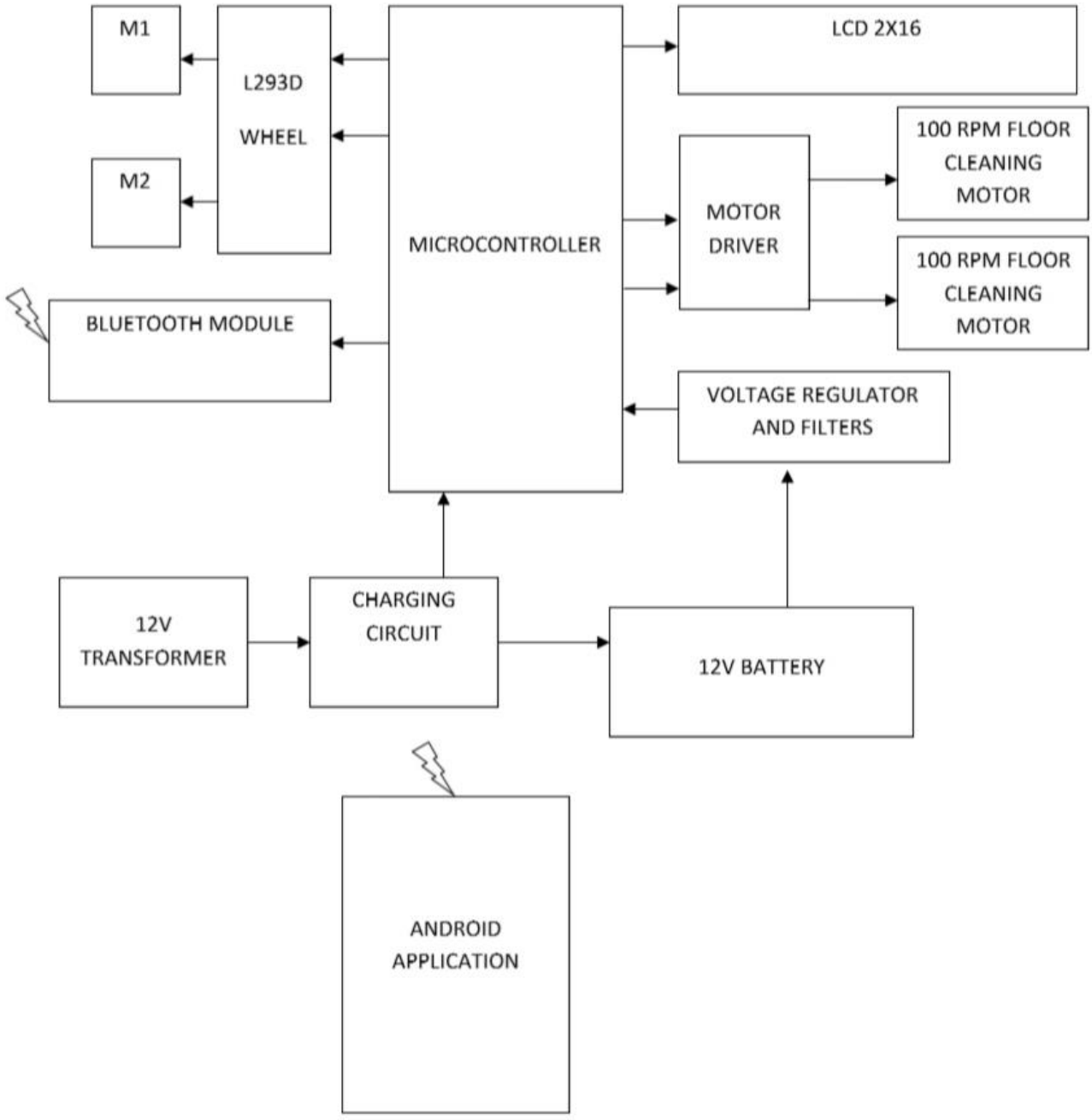

Fig-1: Block diagram

III.HARDWARE USED

Atmega 16 Microcontroller

Fig-2: Atmega 16 Microcontroller

Atmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about RISC and CISC Architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz.

Atmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively.Atmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD.

Atmega16 has various in-built peripherals like USART, ADC, Analog Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals. The following table shows the pin description of Atmega16.

HC-05 Bluetooth Module

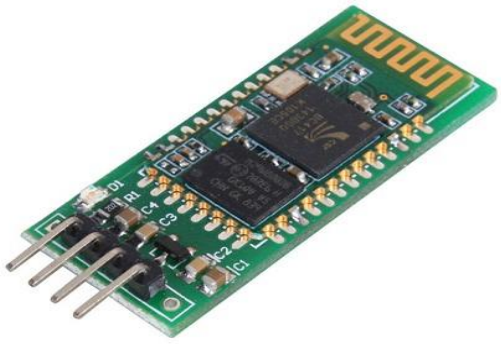

Fig-3: HC-05 Bluetooth Module

HC-05 Technical Specifications

- Serial Bluetooth module for Arduino and other microcontrollers
- Operating Voltage: 4V to 6V (Typically +5V)
- Operating Current: 30mA
- Range: <100m
- Works with Serial communication (USART) and TTL compatible
- Follows IEEE 802.15.1 standardized protocol
- Uses Frequency-Hopping Spread spectrum (FHSS)
- Can operate in Master, Slave or Master/Slave mode
- Can be easily interfaced with Laptop or Mobile phones with Bluetooth
- Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.

The HC-05 is a very cool module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. There are many android applications that are already available which makes this process a lot easier.

H-Bridge Motor driver

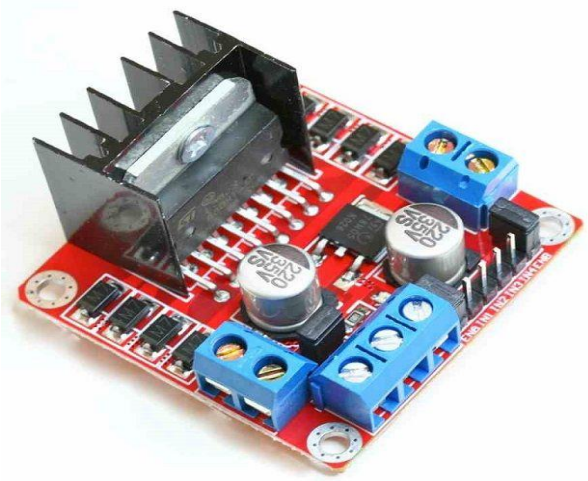

Fig-4: Motor Driver

A **H bridge** is an electronic circuit that enables a voltage to be applied across a load in either direction. These circuits are often used in robotics and other applications to allow DC motors to run forwards and backwards.
It works on the concept of H-bridge, a circuit which allows the high voltage to be flown in either direction. In a single L298D IC there two H-bridge circuit inside the it which can rotate two dc motor independently. Due to its size it is frequently used in robotic application for controlling DC motors.

DC Geared Motor

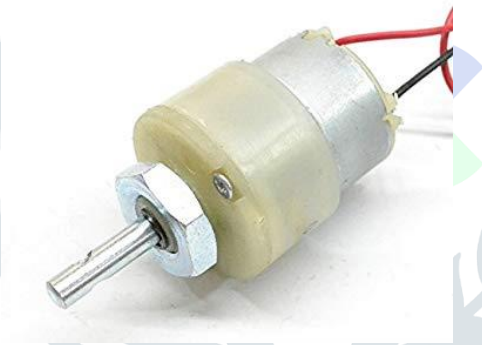

Fig-5: Geared Motor

Geared dc motor can be defined an extension of DC motor. A geared DC motor has a gear assembly attached to the motor. The speed of the motor is counted in terms of rotations of the shaft per minute and is termed as RPM. The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gear in a gear motor, its speed can be reduced to any desirable figure.

The working of the gears can be explained by the principle of conservation of angular momentum. The gear having smaller radius will cover more RPM than the one with larger radius. However, the larger gear will give more torque to the smaller gear than vice versa. The comparison of angular velocity between input gear (the one that transfers energy) to output gear gives the gear ratio. When multiple gears are connected together, conservation of energy is also followed. The direction in which the other gear rotates is always the opposite of the gear adjacent to it.

LCD 2X16 Module

Fig-6: LCD Display

A **liquid-crystal display** (**LCD**) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage. They are common in consumer devices such as DVD players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in nearly all applications.In this, it is used to display the status of the bot and it is also used to display the distance between the obstacle and bot with the help of Ultrasonic sensor.

Relay

Fig-7: Relay

A **relay** is an electrically operated switch. Many relays use an electromagnet to mechanically Operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

Android Application

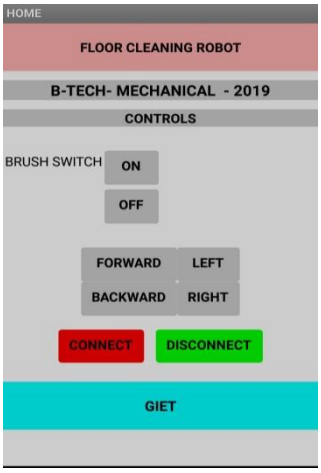

Fig-8: Android application overview

Android application is used to control the robot by connecting it to the bluetooth. It consists of controls for swithching on/off for the rotating brushes and to move the robot towards the required direction.

IV. RESULTS AND DISCUSSION

When the robot is turned on, the user can connect the robot to his phone through bluetooth and control the robot as his choice .By operating the controls in the Android app,the user can move the robot to the required position and clean the required floor space by using rotating brushes. It was observed that the robot was quite efficient.

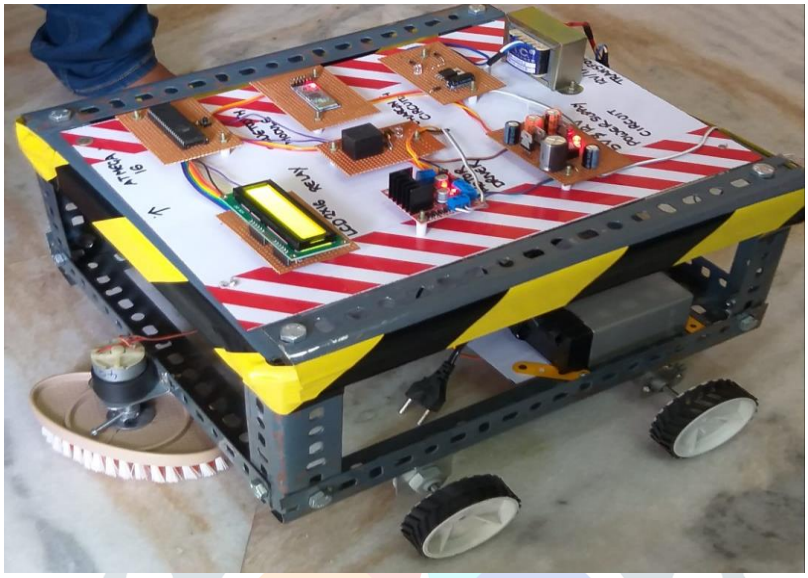

Fig-9: Overview of robot

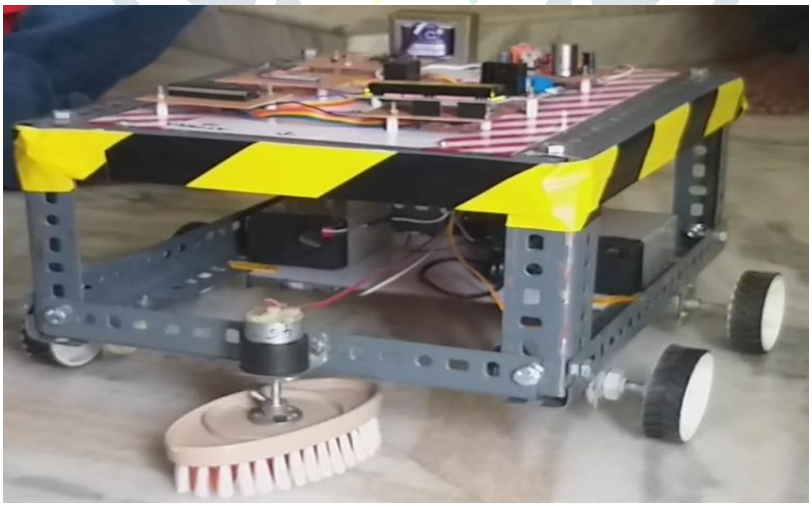

Fig-10: Rotating brushes

V. CONCLUSION

This research facilitates efficient floor cleaning with sweeping and mopping operations. In automatic mode, the robot operates autonomously. The operations such as sweeping,mopping are performed automatically. User can operate this robot with the help of bluetooth based android application. It reduces the labor cost and saves time also and provides efficient cleaning. Further, the robot can be made to move randomly in any direction and its speed can be controlled.

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