

AUTO FLOOR SWEEPER

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Abstract - The advancements made in technology of robotics have made life of mankind very much easier and comfortable. This paper describes a smart floor cleaning robot that allows cleaning the floor by giving instructions to the robot. This robot makes floor cleaning process easy and fast utilizing a wireless robotic cleaning system. This wireless system consists of a transmitter application that runs on an android mobile app which allows the robot to follow commands given by the user through the transmitter app. The proposed robot consists of PIC controller which has fourteen digital input/output pins, robotic arm with cleaning pad with a water sprayer for efficient cleaning. The pic controller, on receiving the commands from android device through Bluetooth receiver, decodes the given commands and controls the motors to achieve the desired path and direction.

Key Words: Floor Sweeper, Android App, Bluetooth Module, L293D Motor Driver IC, DC motor, PIC controller.

1. INTRODUCTION

In the recent years, robots have been used for various cleaning purposes. Robots have various cleaning expertise like mopping, picking up the waste, wet floor cleaning, dry vacuum cleaning etc., Depending on the cleaning mechanism, these robots may have some advantages and disadvantages. Smart floor cleaning robot has been designed for home and office environments. This robot will be using water storage with anti-infection solution which is pumped with water pump motor. This robot on receiving the commands from the android device cleans a area using a cleaning pad by

spraying water on the floor. After cleaning the wet floor, it can drain the dirty water into the required container as per the commands given to it. The robotic arm is used for efficient and effective wet floor cleaning purpose. This system can also be used to pick up the objects and carry them within the Bluetooth range. The proposed system is a manual system because it is controlled by android application which is operated by human. The proposed system functioning is entirely depended on the commands that are received from the android app.

1.2. LITERATURE REVIEW

A robot vacuum cleaner is an autonomous robotic vacuum cleaner which includes self-drive mode and cleans the floor autonomously without human control. This robot vacuum cleaner consists of spinning brushes, mopping, UV sterilization and security cameras for cleaning purpose. This vacuum cleaner had some drawbacks like colliding with obstacles and stopped at a shorter distance from walls and other objects. It was not able to reach to all corners and edges of the room and left those areas unclean [3].

An automatic floor cleaner robot has brushes attached to its sides to collect the dust. This robot uses ultrasonic sensors to avoid obstacles and change its direction and it has a suction unit that sucks in the dust while moving around the room freely. But the drawback of this robot is that it cannot clean the wet floor [4].

Roomba vacuum cleaner robot is arranged at 27o angle, the sweeping brush placed under it sweeps the dust and waste

from corners and edges. It has a powerful motor suction unit which sucks in the dirt into the filtered dust bin

2. PROPOSED SYSTEM

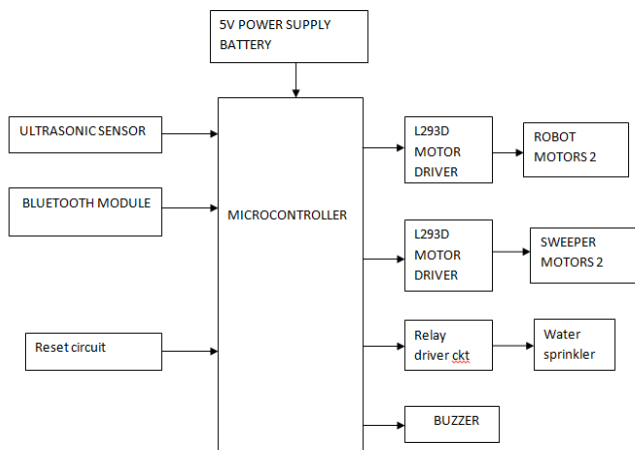


Fig 1: Block Diagram of System

The proposed model “Auto Floor Sweeper” shows fig 1 for better understanding of the proposed work. This block diagram consists of 12v DC motor, L293D IC, IR Sensor, Bluetooth module, cleaning mechanism and PIC18f4520 microcontroller. The power supply is given to the controller, all sensors as well as to relay. The relay works as switch so that it controls the water pump whenever the user receives the commands from transmitter app. The robotic consists of two dc motors where one dc motor is used for moving 1st brush; second dc motor is used to swap 2nd brush. Here we use L239D drivers for driving dc motors to move in forward and backward direction. Bluetooth module is used to control the robot using mobile phone application within a range. The IR sensor used here is used to detect the obstacle and gives indication of a obstacle using buzzer.

A. PIC 18f4520 microcontroller:

Data Memory up to 4k bytesn Data register map - with 12-bit address bus 000-FFF

- Divided into 256-byte banks

- There are total of F banks
- Half of bank 0 and half ofbank 15 form a virtual (oraccess) bank that is accessibleno matter which bank isselected – this selection isdone via 8-bits
- Program memory is 16-bits wide accessed through a separate program data bus and address bus inside the PIC18.
- Program memory stores the program and also static data in the system.
- On-chip External
- On-chip program memory is either PROM or EEPROM.
- The PROM version is called OTP (one-time programmable) (PIC18C) The EEPROM version is called Flash memory (PIC18F).
- Maximum size for program memory is 2M n Program memory addresses are 21-bit address starting at location 0x000000



Fig -2: PIC18f4520

B. Ultrasonic sensor:

Ultrasonic ranging module HC -SR04 provides 2cm -400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:(1) Using IO trigger for at least 10us high level signal.(2) The Module automatically sends eight 40 kHz and detect whether

there is a pulse signal back.(3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time) * (velocity of sound (340M/S) / 2.



Fig -3: Ultrasonic Sensor

C. L293D motor driver IC:

A motor driver is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver act as an interface between controller and the motors. The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE, etc. These ICs are designed to control 2 DC motors simultaneously. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor. We will be referring the motor driver IC as L293D only. L293D has 16 pins.

The L293D is a 16 pin IC, with eight pins, on each side, dedicated to the controlling of a motor. There are 2 INPUT pins, 2 OUTPUT pins and 1 ENABLE pin for each motor. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor.

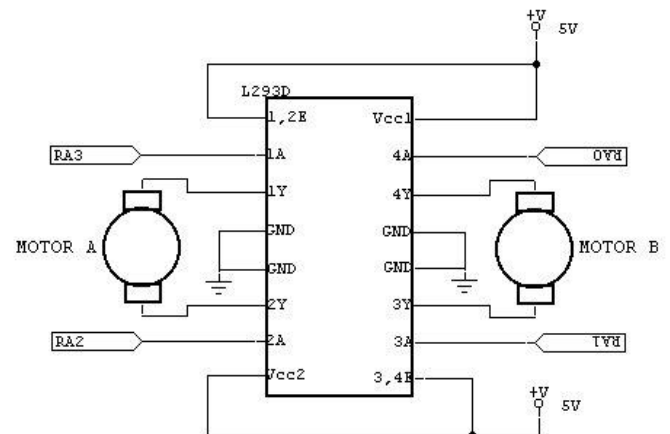


Fig -4: L293D Motor Driver IC

D. Bluetooth Module:

For the communication of the robot with the cell phone or a mobile we are using the Bluetooth device. The Bluetooth device (HC-06) is attached to the robot that receives the data from the mobile and also it can transmit the data. It is used for converting serial port to Bluetooth. It has two modes: Master and Slave.

Bluetooth is a wireless communication protocol running at the speed of 2.4 GHz with the architecture of client-server and which is suitable for forming personal area networks. It is designed for devices such as mobile phones (low power). Bluetooth protocol uses the MAC address of the device. Bluetooth gives the connectivity between two devices using their MAC address.

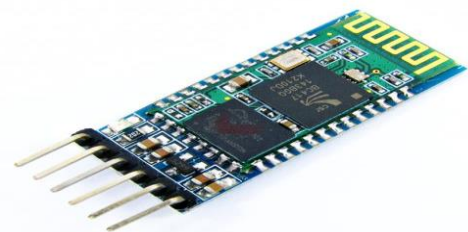


Fig -5: Bluetooth Module

E. DC Motor:

A DC motor is an electrical machine which converts electrical energy into mechanical energy. The basic working principle of the DC motor is that whenever a current carrying conductor places in the magnetic field, it experiences a mechanical force these motors are simple DC Motors featuring gears for the shaft for obtaining the optimal performance characteristics. They are known as Center Shaft DC Geared Motors because their shaft extends through the center of their gear box assembly.

This DC Motor – 100RPM – 12Volts can be used in all-terrain robots and a variety of robotic applications. These motors have a 3 mm threaded drill hole in the middle of the shaft thus making it simple to connect it to the wheels or any other mechanical assembly.



Fig -6 DC motor

F. Buzzer:

Buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical and piezoelectric. Typical use of buzzer or beeper includes alarm device, timer and confirmation of user input such as a mouse click or keystroke. Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contact so buzz. Often these

units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made. The buzzer consists of an outside case with two pins to attach it to power and ground.



Fig -7 Buzzer

3. CONCLUSIONS:

This research paper presents a "Automatic floor sweeper" process can be done in an easier manner and more efficiently by robot utilizing wireless robotic system. This proposed robot reduces the time and cost of labor. The Product developed is definitely a very important product in robotics and floor cleaning area .The robots developed uses 2 sweeper motors which ultimately provides lots of rotation and power loss in the system. Since in project the floor cleaner is incorporated with different devices like DC motor(s), ultrasonic sensors etc., so it will be easy to handle it also saves time and will work automatically for cleaning purpose at homes and offices. With simple algorithm and program, the cleaner will be able to cover large floor areas as well as find its way into and out of small corners. As the cleaner traverses the room, the sweeper installed in it will manage to pick up a significant amount of dirt. Manual Sweeping might not be that effective as it will not be picking up everything in as it is not in sight but using the automatic floor cleaner it can be done easily.

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