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Robo Cleaner

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Abstract: **Identification and designing of an autonomous robot that will assist people at home who are too busy for daily or weekly floor cleaning, especially for families with children. It will also particularly be help for the elderly who live by themselves and do not have the strength or ability to clean. Robotic vacuum cleaners in the market are expensive. The goal is to design a unidirectional platform with sensors to improve the cities cleaning performance problems. The hardware uses Bluetooth module HC-05 and uses microcontroller AT89C2051. It is used to control the movements of hardware with the help of Bluetooth module. The testing shows that the developed model can clean the refuse.**

Keywords: **Robo Cleaner, autonomous robot, vacuum cleaner, Bluetooth module HC-05.**

1. INTRODUCTION

Robo cleaner is a machine that can clean the surface or floor automatically. It is capable to clean the floor in such area where we are not able to go i.e. blow badly or sofa or any corner etc. For cleaning a surface or floor, vacuum cleaner is used. It is a system that contains sensors, control systems, manipulators, power supplies and software all working together to perform a task. The cleaning robot uses a microcontroller to detect obstacles and manipulates its direction as per the inputs. It is programmed to accept inputs to sense obstacles around it and control the robot to avoid any collisions. In case of an obstacle, or a potential collision, the microcontroller controls the wheels of the robot by a motor driver to avoid collision. The vacuum cleaner at the bottom of the robot performs the cleaning process.

2. SYSTEM DESCRIPTION

The entire system model consists of vacuum cleaner which is used for cleaning purpose. The system has the following components.

Table: Components and Their Specifications

S. NO.	EQUIPMENT	SPECIFICATION
1)	Motors	DC geared motor, 6-12 V, 200 RPM
2)	Motor	DC geared motor, 6-12 V, 60 RPM
3)	Microcontroller T89C2051	AT89C2051, 2.7 V-6V,
4)	Motor Driver IC	L293D, 600 mA o/p current, 1.2 A peak o/p current
5)	Bluetooth module	HC-05, typical -80dBm sensitivity, up to +4dBm RF transmit power, Low Power 1.8V Operation,1.8 to 3.6V I/O
6)	Crystal Oscillator	3.3V or 2.5V Operation, Output Frequencies to 260MHz, <0.7 ps RMS jitter, 12k-20MHz
7)	Relay	ULN2003, Output Current to 500 mA, Output Voltage to 95 V, Transient-Protected Outputs

2.1 BASIC COMPONENT USED:-

2.1.1 MICROCONTROLLER - The AT89C2051 is a low-voltage, high-performance CMOS 8-bit microcomputer with 2 Kbytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high density non-volatile memory technology and is compatible with the industry standard MCS-51 instruction set and pinout. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C2051 is a powerful

microcomputer which provides a highly flexible and cost effective solution to many embedded control applications.

The AT89C2051 provides the following standard features: 2 Kbytes of Flash, 128 bytes of RAM, 15 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplex serial port, a precision analog comparator, on-chip oscillator and clock circuitry. In addition, the AT89C2051 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning. The Power Down Mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset.

2.1.2 BLUETOOTH MODULE – HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

2.1.3 MOTOR - Four motors are used in the system. Three of these are DC geared motors, one of them is used for vacuum cleaner, and the other two are used for the forward and backward motion of the system. While the system moves forward and backward, the motor moves in clockwise and anti-clockwise direction. The motors work are designed for 6-12V with a speed of 200 RPM. Besides this, we also have a motor having a speed of 60 RPM.

2.1.4 L293 MOTOR DRIVER - The L293 Motor Driver has 4 inputs to control the motion of the motors and two enable inputs which are used for switching the motors on and off. To control the speed of the motors a PWM waveform with variable duty cycle is applied to the enable pins. Rapidly switching the voltage between Vs and GND gives an effective voltage between Vs and GND whose value depends on the duty cycle of PWM. 100% duty cycle corresponds to voltage equal to Vs, 50 % corresponds to 0.5Vs and so on.[4] The 1N4004 diodes are used to prevent back EMF of the motors from disturbing the remaining circuit. Many circuits use L293 for motor control, we chose L298 as it has current capacity of 2A per channel @ 45V compared to 0.6 A @ 36 V of a L293D. L293D‟s package is not suitable for attaching a good heat sink; practically you can't use it above 16V without frying it. L298 on the other hand works happily at 16V without a heat sink, though it is always better to use one.

2.2 METHODOLOGY:

2.2.1 Developing basic requirement to clean the floor- The basic requirements were appropriate size and design, effective manner of collecting refuse, efficient algorithm.

2.2.2 Designing a sensor circuit:

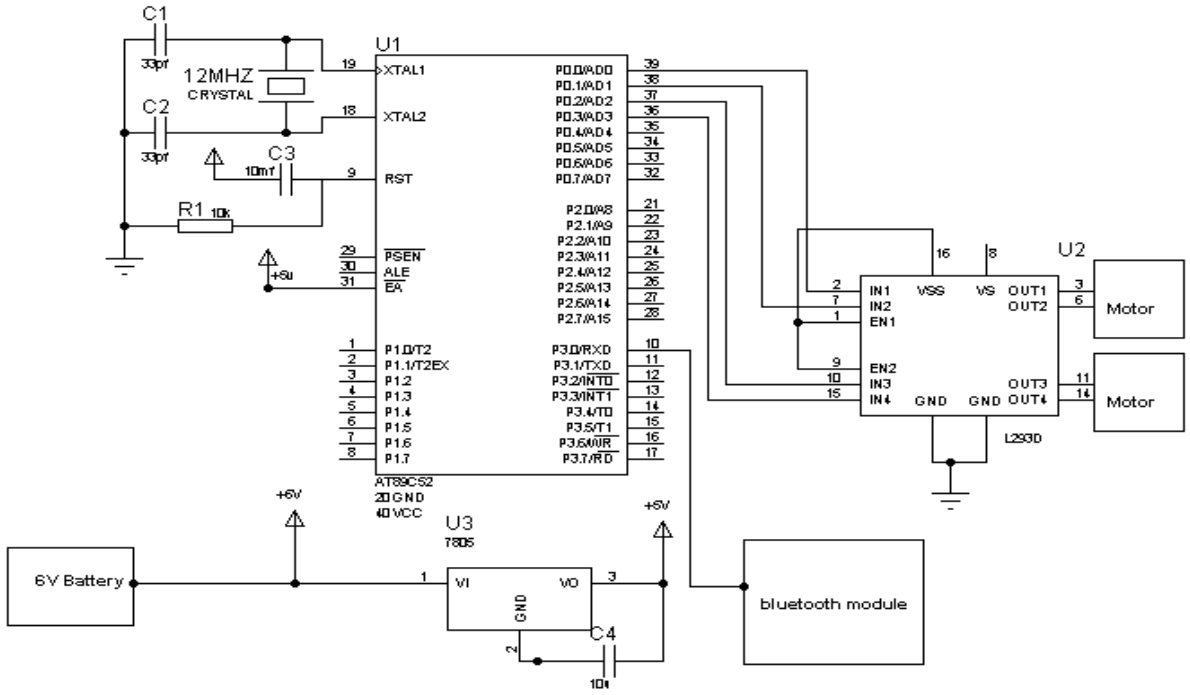

FIGURE 2.2.1 ROBOCLEANER CIRCUIT

3. FUTURE ASPECTS

We are dedicated to make the robot smart enough to detect all objects in any position of room. In the future we can make the robot smarter such that when the robot cleans any room it will save the information about obstacle and its location and if the user want to clean a room it just will restore information and will clean faster. We can make the robot to clean tables such that it can detect edges and it will clean the tables without falling down**.**

4. RESULT

Experimental result of the system which is proposed in this paper is as below. The hardware implementation of the robocleaner is shown in figure 4.1 and 4.2. The robocleaner efficiently cleans floor when instructed.

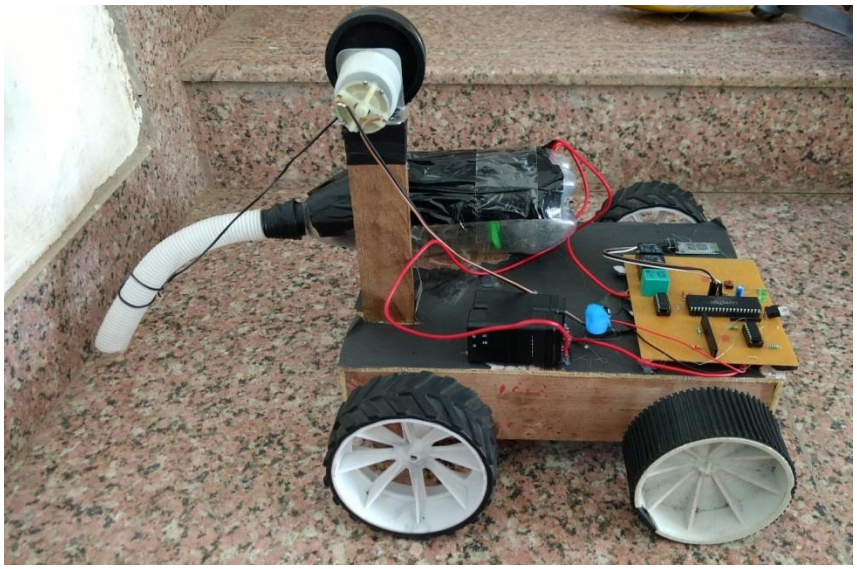

FIG 4.1 HARDWARE IMPLEMENTATION

5. CONCLUSION

This paper facilitates efficient floor cleaning within a certain area with the use of developed robo cleaner. Robotic vacuum cleaner is developed to make cleaning process easier especially for working people. This Robotic Vacuum Cleaner is designed for specific areas. Moreover there are still new ideas to improve the given developed cleaner system. New functionalities can be incorporated. When cleaning a large area, the usage of a single unit is not found efficient, therefore application of many units may improve the case. A GSM module can be designed which can tell us that the robocleaner has done the task of cleaning.

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