

# Smart Robot – Sweep Cleaner

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**Abstract**— The this paper gives the details of development of smart robot for the surface cleaner. The project is used for domestic and domestic purpose to clean the surface automatically. When it is turn on, its spreads the water on surface and cleanly around surface area as it passes over it. The controller used to drive the motors and the motor drive also used to interfacing between DC motor and controller to giving the direction. These can be useful in improving lifestyle of mankind.

**Keywords**—Arduino NANO, DC motor, Water pup, Bluetooth module;

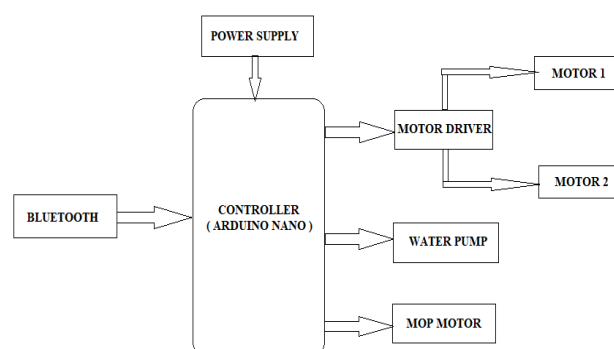
## 1. INTRODUCTION

In earlier days, robotic cleaner have taken major attention in robotics research due to their effectiveness in assesting humans in floor cleaning applications at homes, hospitals, restaurants, offices, workshops, universities, warehouses, etc. Uman Khalid [2]. Generally, in recent years, people prefer to use trains or buses for travelling and hence the biscuit covers, cold drink bottles and chocolate wrappers are littered around.so, it is important to clean the bus or railway station regularly. M. Ranjit Kumar[1]. The main aim of the project is develop and modernized process for cleaning the surface. The surface washer is new mechanistic type for solving problems of floor cleaning, pipe cleaning, surface cleaning, that make life more difficult. Floor cleaning is more important for our health and reducing the man power requirement. Mayank Lalka[3]. Automatic floor cleaner are designed in such way that it is capable of cleaning the surface and reducing human efforts.it can easily move around freely and clean a specific area. Brushes are attached at its side for cleaning the surface while moving. Manya Jain[4]. Every cleaning and operating mechanism of robotic floor cleaning have its their own merits and demerits. For example, robots using laser mapping are relatively faster, less time consuming and energy efficient but expensively, but obstacle avoidance based on robots are relatively time consuming and less energy efficient due to random cleaning but cheaper. Harshvardhansinh Parmar[5]. The floor cleaning machines are very much required in places like schools, colleges, hospitals, bus and railway platforms, airport lounges, stadiums, parking areas, footpaths and many other commercial areas, majorly because these places have large areas to be cleaned. These machines can be manually operated, mechanically operated, fully automated, semi

automated, wire controlled or remote controlled, fuel powered or solar powered. B Vishwas[6].

## 1.1 SYSTEM ARCHITECTURE

Fig:1 shown below is the block diagram of smart robot sweep cleaner. Microcontroller (ATmega328) is used which provide clock signal (quartz crystal operating at 16 MHz Frequency). DC motor attach to motor drivers (L293D) to provide high current almost importantly it is installed with DC mop motors and water pump to perform cleaning operation effectively. For power supply batteries are used.



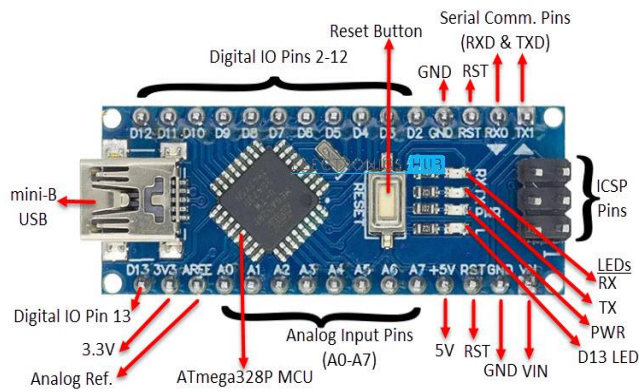
**Fig-1: Block Diagram**

## A. HARDWARE USED

- Arduino NANO (ATmega328)
- Bluetooth Module (HC-05)
- Motor Drive (L293D)
- DC Motor
- Water Pump
- Battery

## ATmega328/Arduino

An Arduino NANO board, and it is one kind of microcontroller board which is designed by the Arduino team. This microcontroller is based on Atmega168 or Atmega328p. It is fairly similar to Arduino UNO board but when it comes to pin-configuration and features, this NANO board has replaced Arduino UNO due to small in size. Arduino NANO is one type of microcontroller board. Microcontroller (ATmega328) is used which provide clock signal (quartz crystal operating at 16 MHz Frequency).



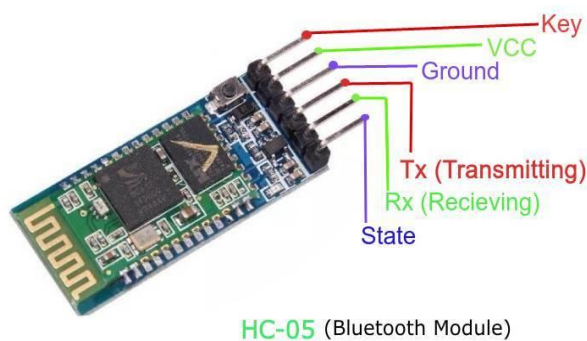
**Fig-2: Arduino pin Description**

### Technical Specification

|                         |                 |
|-------------------------|-----------------|
| Microcontroller         | ATmega328       |
| Architecture            | AVR             |
| Operating Voltage       | 5 V             |
| Flash Memory            | 32 KB           |
| Clock Speed             | 16 MHz          |
| Analog IN pin           | 8               |
| DC Current per I/O pins | 14 mA           |
| Digital I/O pins        | 22 (6 PWM pins) |
| PWM O/P                 | 6               |

### Bluetooth Module

Bluetooth module, HC-05 module is to use Bluetooth serial port protocol module, which can helps to wireless transmit and receives the serial data. We can simply use the Bluetooth module for serial port replacement to embedded project and personal computers for transfers the data.



**Fig-3: Bluetooth Module**

### Motor Drive (L293D)

A motor driver L293D designed IC chip which can usually used for control motor in automatic robots. Motor driver is act as an interfacing between arduino and motors. These L293D, L293, L293NE, etc. these ICs are designed for controlling two DC motors at same times. L293D IC has 16 pins.



**Fig-4: Motor Drive**

### DC Motor

The 12V DC motor are very useful in a robotic applications. The gear box of these motor is provide greater torque that is required to drive robotic vehicles. Based on the geared box design the RPM (speed) and torque (T) of motor will vary. These particular motor is rated for 100rpm speed and 2.9 kg/cm torque. The motor also comes with hex nut to make mounting process easy.

The DC motor has 100rpm and the voltage rating which is useful specification for to make these geared motor like retro fitable in all- terrain robots and variety of robotic project. The motor shaft has 3mm threaded drill hole in middle which is very useful for mechanical assembly.



**Fig-5: DC motor**

## Water Pump

12V water pump is a DC electric water pump motor that powered by 12V DC power supply. DC water pumps are small pumps powered by battery, DC power supply. The primary use of DC water pump is to circulate pressurized and emulsify liquids. Gas specifically used in where is a water is in short supply.



**Fig-6: Water Pump**

## Battery

The power supply for this kit is given through a 12V rechargeable Battery. The output of Arduino NANO is very low. Its difficult to drive the geared motor (DC motor) and the water pump to be controlled via Arduino NANO, so there has to be an external circuit as both of them need 12V power supply to run but Arduino NANO can only provide 5V power supply.



**Fig-7: Battery**

## B. SOFTWARE DESCRIPTION

### 1. Arduino IDE

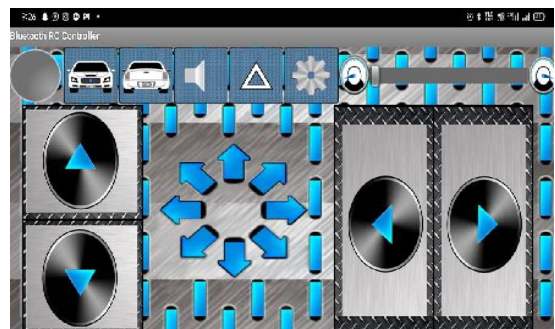
To program the Arduino the Arduino IDE is used which is free software that enables programming in the language that the Arduino understands. In the case of the Arduino, the language is based on C/C++ and can even be extended through C++ libraries. The IDE enables writing a computer program which is a set of step-by-step instructions that is then uploaded to the Arduino. Arduino will then carryout those instructions and interact with whatever it has been connected to it. In the Arduino world, programs are known as “sketches”.



**Fig-8: Arduino IDE**

### 2. Bluetooth RC Controller

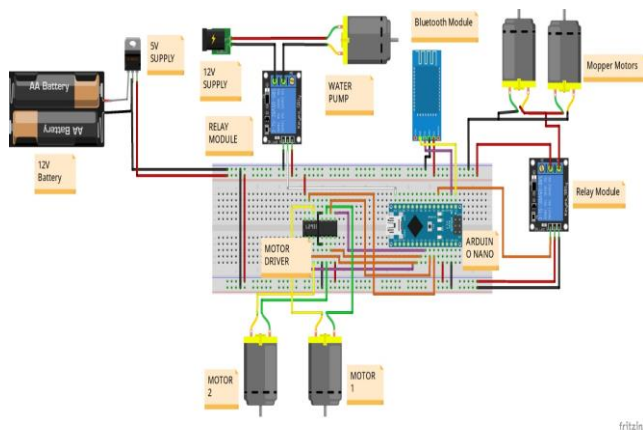
Bluetooth RC Controller application is used to send signal and receives signals in between android phone and Arduino hardware. Here Arduino act as main controller of device which receives signal or commands and sends these commands to motors and motor drivers to perform particular task.



**Fig-9: Bluetooth RC Controller**

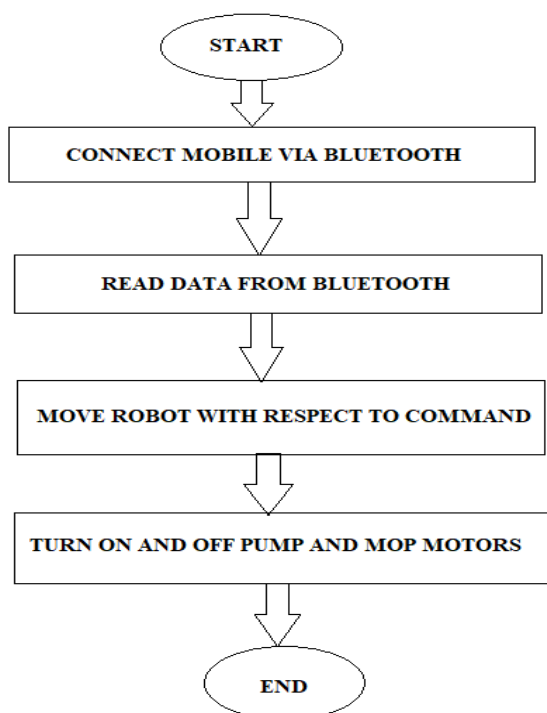


## 1.2 WORKING



**Fig-10: Circuit Diagram**

The smart robot – sweep cleaner has two brushes attached to its left and right side to clean the surface. The robot cleaner uses advanced technology to automatically clean your floors while you are away or busy doing other works/things. Here are some other benefits of owning a robot cleaner is convenience and time saving. “Smart Robot – Sweep Cleaner” is very simple in construction and easy to operate any persons. The size of the machine is also small and portable, so we can transfer it from one place to another place very easily. It can operate during a power outage period and does not need any human guidance.



**Fig-11: Flow Chart**

## 2. FUTURE SCOPE

1. The setup can be fully automated without manual interventions.
2. Image processing technique can be implied to analyses the surface cleaning efficiency using a high quality on board camera.
3. Germ less cleaning using UV exposure installed on the vehicle.

## 3.CONCLUSION

In this project design and development of Smart Robot –Sweep Cleaner is discuss the concept has proved this project is and efficient way of time saving and helps to physically disable people. These robotics specially beneficially for working women.

With simple algorithm the cleaner will able to cover large floor area as well as find its way into and out of small corners. The structure of robot can be made more attractive for better acceptance at home or office environments.it depends on DC power supply and favorable for battery specially for long operation and cost effectiveness.

Since in project the floor cleaner is incorporate with different devices like DC motors, Bluetooth module, water pump, etc. so it will be easy to handle thus it also saves time and will work automatically for cleaning purpose at homes and offices.

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