

# Wireless Floor Cleaning Robot

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## ABSTRACT

Nowadays human and machine interaction with each other is moving away from only pen and computer and is becoming much more pervasive and much more congruous with the physical world. As the days are passing, gap between the human and the machines have been reduced by their interactions because of artificial intelligence. Manual controlling work by human is taken over by the robot technology and many of connected appliances have been used extensively. So here, we represent the technologies that intend the working of floor cleaning robot in any of two modes that is automatic and manual. 80S52 microcontroller controls all the software and hardware operations. The robot can perform sweeping and mopping task. The robot is incorporated with IR Sensors for obstacle detection and automatic water spray pump. Four motor are used to for cleaning one for water pump and one for wheels.

**Keywords:** Human, Machine, Artificial Intelligence, Robot, Sensors

## 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 guide by the logic controller designed. Robots plays an important role in each every field of life. It is use in industries, in households and in institutes. Now a day the robots are just becoming as intelligent as human.

Here we had designed a cleaning machine is operated using Smartphone. A Smartphone is a mobile phone built on a mobile computing platform, which has more advanced connectivity and computing ability than what a feature phone has. The innovation in this project is obstacle avoidance and control using android app via Wi-Fi.

This cleaning robot is an electric home appliance, which works in two modes as per the customer's comfort "Manual and automatic". Unlike other floor cleaner robots this is not a vacuum cleaner robot; it

performs sweeping and mopping operation. Detachable mop is used for mopping. It works on 12V supply. In the automatic mode, robot performs all operations itself. First robot starts it moves ahead and performs cleaning operation. IR sensors are used for obstacle detection and to avoid hurdle.

Microcontroller is the brain of robot where program is written and sensors are connected as input and actuators as output. Various algorithms like fuzzy controller govern the controlling of the robot, machine learning based practices and artificial neural network based algorithms. There are two types of controllers, one is continuous controller and another is PID based controller. Continuous controller is more direct and less effective while PID controller is more advanced and varies according to the current state and gives efficient result.

## II. LITERATURE REVIEW

Traditionally floor is cleaned with the help of dry mop or wet mop using the hand as a potential tool.

They have to scrub hard on the surface. The cleaning includes cleaning of various surfaces cement floors, highly polished wooden or marble floors. Among these floors the rough surface floor such as cement floor, mostly present in semi urban areas are covered with so much dust.

From early human civilization human is increasingly dependent on the machines. Human is trying to reduce the workload upon himself. By the help of machines, also we can get huge efficiency because there is no chance of human error there. Now -a - day's intelligence and robotics growing with a vast pace. If we look at past years, we will see robotics from large structure going to small and smaller in Nano range. Very complicated sensors have been designed to help the robot in various works .Complicated pneumatic and actuating systems have been designed. One of the best examples is the mobile phone. Also now-a-days complicated artificial intelligence algorithms like unsupervised and supervised learning, Swarm optimization, ANT algorithm, natural heuristic search are playing a major role in designing control system of the most of the mobile robot.

### III. PROPOSED SYSTEM

A robotic cleaner is an autonomous electronic device that is intelligently programmed to clean a specific area through a vacuum cleaning assembly. Some of the available products can brush around sharp edges and corners while others include a number of additional features such as wet mopping.

- ✓ Robot can be operated automatically and manually as per the user convenience.
- ✓ Robot can be operated using Android app.
- ✓ Will provide the security feature by user.
- ✓ It will spray the water from small tank fitted on panel.
- ✓ Motor will start rotating and mob attached will clean the floor.
- ✓ Sensors are attached to detect the physical barrier.

- ✓ Dryer motor is also attached to dry the wet floor.
- ✓ User Registration.

### IV. METHODOLOGY

This section takes a vast look at Android smart phones and its features, hardware components, and how Smartphone will help to develop a community in the environment, it is used.

#### 2.1 Android Platform:

Android Platform is powerful mobile computer and they become more and more popular smart phones used worldwide. They become more and more popular for software developers because of its powerful capabilities and open architecture; also it is based on JAVA programming language. Because android uses JAVA programming language getting started with the Android API is easy; the API is open and allows easy access to the hardware components. Android device provides numerous communication interfaces like USB, WI-Fi, Bluetooth that can be used to connect to the robot. It is a great platform for robotic for robotics system control, because it is much cheaper than any other ARM-based processing unit is. We have chosen android platform because it is the widest used platform in the world and runs the largest number of smart phones worldwide.

#### 2.2 DC Motor:

A DC Motor is electrical machines that convert direct current energy into mechanical energy. These type motors normally carry loads that require distinct speed regulation. Start torque developed in series motors normally ranges between 300% and 375% of full load, but can be reach high as 800% of full load torque. These motors can easily be configured in 2 to 3 speed, as well as reverse modes. DCM Permanent Magnet DC Motors produce high running torque, and provide a relatively simple, high efficiency DC drive as compared to other wound field motors. One of the advantage of a DCM

Permanent Magnet DC motor is high efficiency. These motors are easily reversed by changing polarity.

### 2.3 PIC16F877A Controller:

Circuit board is a surface where electronic components interconnected are assembled. The several types of existing circuit boards may be divided into two broad categories: those intended for prototype or experimental circuits, and those intended for production and/or commercial sale. Circuit boards used for work are often referred to as breadboards, or proto boards. Breadboards allow engineers to construct circuits quickly, so that they can be studied and modified until an optimal design is discovered. In typical breadboard, adhoc manner is used to design a circuit and components and wires are attached on that circuit, with new data and new understanding dictating the course of the design. Since breadboard circuits exist only in the laboratory, no special consideration need be given to creating reliable or simple-to-manufacture circuits—the designer can focus exclusively on the circuit's behaviour.

### 2.4 Display 16\*2:

LCD (Liquid Crystal Display) screen is an electronic display module and used in large range of applications. A 16x2 display is basic module and commonly found in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The 16 x 2 enlightened alphanumeric dot matrix displays is capable of displaying 224 different characters and symbols. A full list of the characters and symbols is printed on pages 7/8 (note these symbols can vary between brand of LCD used). This booklet provides all the technical specifications for connecting the unit, which requires a single power supply (+5V).

### 2.5 Ultrasonic Sensor:

Ultrasonic transducers are divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into

ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound. In a similar way to radar and sonar, ultrasonic transducers are used in systems, which evaluate targets by interpreting the reflected signals. For example, by measuring the time between sending a signal and receiving an echo the distance of an object can be calculated. Passive ultrasonic sensors are microphones that detect ultrasonic noise that is present under certain conditions Ultrasonic probes and ultrasonic baths apply ultrasonic energy to agitate particles in a wide range of materials.

## V. IMPLEMENTATION

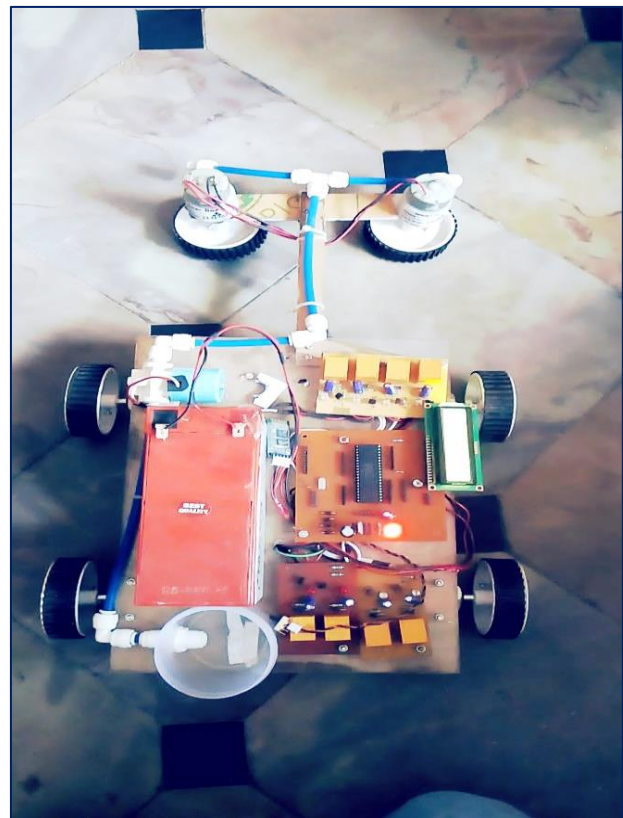
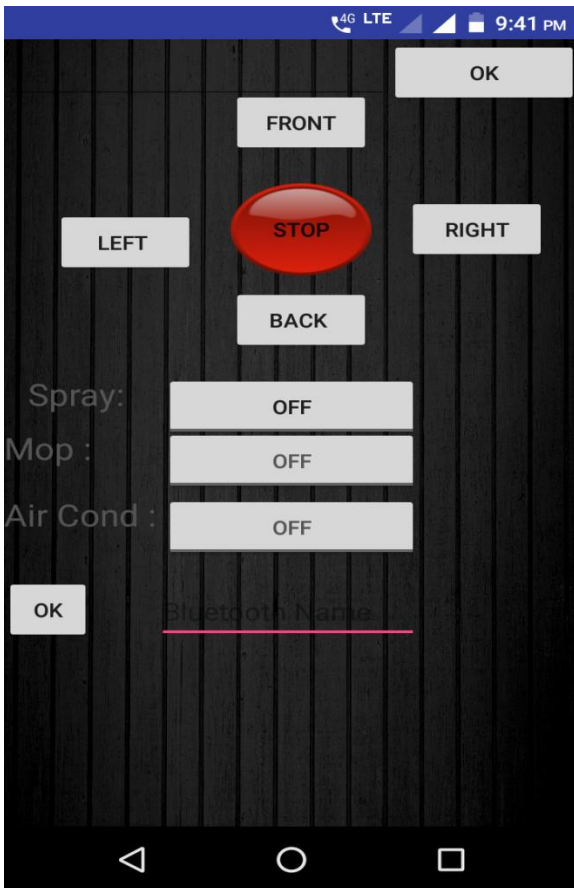


Figure 1

In this Project, we use PIC Controller, which is connected to Power supply (5-12V) to a battery. Here we use relay driver, a relay as we all know is an electromechanical device, which is used in the form of a switch it is connected to solenoid valve. DC motor and cleaning mechanism can be operated using relay. Also for hardware controlling purpose, we use RF transmitter and receiver. Here IR sensor is

used for obstacle detection and ultrasonic sensor is used for fall detection. Driver circuit is connected motor. For moving the wheels in clockwise or anticlockwise direction, motor is use also for pick and place operation we use motor. Solenoid valve is connected to supply the water-to-water sprays rotating motors are connected which work as mop. Blowing fan is attached under the robot for drying purpose. A display is attached to show the moment of the robot, which is connected, to PIC Controller.



The Android app is generally developed using JAVA Language. The app controlling this floor-cleaning robot can be built without having the knowledge in java language. Above diagram which shows the interface of the app. It has a buttons and all the button gives different bytes in the output that is to be fed to the PIC Controller to further process. For e.g. if we press Up! Button, the Bluetooth module will give 1 byte at its output. Application Display 1 his app invented by these searches for the Bluetooth devices. All the buttons are active, the app is now connected with the robot, and mobile phone can control the robot.

## VI. TESTING

Front Sensor	Left sensor	Right sensor	Direction
Low	Low	Low	Forward
High	Low	Low	Find route right or left
Low	High	Low	Turn Right
Low	Low	High	Turn left
High	High	High	Find route right
High	High	Low	Find route right
High	Low	High	Find route left
Low	High	High	Find route right

This section explains the sensors' detection and the robot directions based on the searching path. In this development three main underneath, sensors were use, which are the front, the left and the right sensors. Other sensors were not necessary when the robot was use on the PV panels. Table points out each sensor's working and the robot's direction. These sensors were used to control the movement of the robot by using actuators. There are two possible situations for each sensor, which are high or low. A high situation happens when one of the robot sensors detects the ledge and the low situation means the sensor has not detected an edge. These situations are based on the sensor's signal.

The movement and rotation of the cleaning robot was control by the right and left wheels. A similar method was use to design the new software as shown in Table.

Robot Movement	Left Motor	Right Motor
Straight	Straight	Straight
Avoid the left	Stop	Reverse

edge		
Avoid the right edge	Reverse	Stop
Backward	Reverse	Reverse
Right rotating 180°	Straight	Stop
Left rotating 180°	Stop	Straight

This table demonstrated the direction movement of the robot when a sensor detects an edge. There are six possible ways to change the robot's direction.

There are six possible ways to change the robot's direction.

- ✓ First way: When all the sensors are low, the robot will travel straight.
- ✓ The second one; when the left sensor detects an edge on the left side it will stop then turn to the right side four centimetres until the left sensor goes to low.
- ✓ The third situation; when the right edge is detected it will do the same as the left sensor's job when it detects the edge, but the motor's directions will be opposite.
- ✓ The fourth situation is when the robot drives backward in three circumstances. If the front sensor and the right sensor go high the robot will stop, drive back 10cm, change to the left direction, and if all three sensors are high, the robot will stop and drive back 10cm, and then find a route right. The last circumstance is if the front sensor and the left sensor are high, the robot will stop and drive back 10cm, then find a route right.
- ✓ The fifth situation of the robot directions is when the robot rotates 180° to the right side. This happens when the robot reaches the top ledge of the panel; it will stop and travel back 10cm, then rotates 180° as it drives down along the panel.
- ✓ The last situation is when the robot rotates to the left side from the bottom of the panel and

drives up along the panel. The process of the rotation is the same as for the right rotation.

## VII. RESULT ANALYSIS

Today in the world of technology as the new invention are developed every day. People are moving from manual work to computerized work. Earlier people has to clean their floor using human power that is by using mop, clothes. As the invention upgraded they started using vacuum cleaner but the main drawback of vacuum cleaner was people have to move it manually and the wire-attached vacuum cleaner are not sufficient to clean a longer distance. This drawback of vacuum cleaner is overcome in this project by using Bluetooth TX-Rx-Master Unit Module for wireless connection of cleaner. PIC Controller is used to control the movement of the robot and to flow command given by the user to the circuit. This robot reduce the disadvantages of vacuum cleaner it can even clean at the longer distance as well as in manual and automatic mode. If the obstacle is detected while the cleaning process using work the IR sensor detects that obstacle and stops the working for a minimum time span. If the obstacle is not move within that time robot moves towards another direction. A blower fan is used to blow the air and water spray and moping operation is done.

## VIII. CONCLUSION

We have surveyed different components that are going to use in the project and have studied about the components. Completion of this project will bring a new product to the world to increase speed and efficiency. While developing this project, new and innovative solutions were required. Overall, the learning objective of this project provided an opportunity to research beyond the academic requirements.

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