



A Survey on Robotic System for Cleaning the Railway Platform

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ABSTRACT: Robotic Automation is now becoming need of every system. The conventional cleaning work for the platform by humans is not hygienic for human being. It may become reason for spreading many viral diseases. To avoid this here the concept of platform cleaning with no or otherwise very little human intervention is introduced. This system is used to clean the platform by suction using vacuum cleaner and using brushes. System also has provision of automatic water spraying. The forward-backward-left-right motions of the robot are controlled remotely. The robot has provision for avoiding collision. It is done through obstacle detection.

KEYWORDS : Robotic system, Remote controlling System, Power supply, vacuum cleaner, LCD Display, Maximum working capacity, pump, photoelectric sensor, ultrasonic sensor, Bluetooth control app, ArduinoUno

I INTRODUCTION

The robotic cleaners have attracted the field of robotics now days. The Platform cleaning design is being operated in dual modes. In one of the modes, the robot is fully autonomous and making decisions on the basis of the outputs of photoelectric & Ultrasonic sensors. In manual mode, the robot can also be used to clean a specific area of a room by operating it manually.

Robots are used for various requirements in industrial and domestic applications. In this project work a floor cleaner robot based on Atmega18 have been developed. This cleaner robot is an electric home appliance, which operating in two modes as per the user requirement "Automatic and manual". Detachable mop is used for mopping and it works on 12Vsupply. In the automatic mode, robot performs all operations itself. Firstly robot starts it moves forward and reverse direction. For obstacle detection and to avoid hurdle photoelectric sensors have been used. If any hurdle detected then robot change the lane automatically, does not stop and starts cleaning action. Bluetooth module has been used in automatic and manual with 50m range for the make a system wireless. For user convenience automatic water sprayer is attached which automatically spray water for mopping, therefore no need to attach wet cloth again and again for mopping .Motor driver IC has been used to drive the motors and four motors have been used to perform respected operations like to move the robot operates the robot itself. Bluetooth module has been used to transmit and receive the signal to operate the robot through remote. Relays have been used to drive the water pump and cleaner motor. All the information will be displayed on LCD.

In the manual mode, if any hurdle detection in path, Movement of robot is controlled by user itself through remote therefore user can move therefore user can move the robot in the desired direction.

The robot is an efficient alternative for manual scavenging. Compared with the presently available systems, our robot saves on labor costs and time, as a single machine can do the work of multiple laborers in less time. It is eco-friendly as well. It maintains a log of cleaned and unclean area in the secondary storage. It can be made fully automatic. The main constraint in the development of a cleaning robot is the size, since without a minimal size it will not maintain its mobility. Intelligent Platform Cleaning Robot can be worked only in a specified range along the station.

II RELATED WORK

Manreet Kaur& Preeti Abrol explained that the manual work is taken over the robot technology and many of the related robot appliances are being used extensively also. Here represents the technology that proposed the working of robot for Floor cleaning. This floor cleaner robot can work in any of two modes i.e. "Automatic and Manual". [1]

Karthick.T, Ravikumar.A, Selvakumar.L, Viknesh.T, have discussed the idea to develop an autonomous ROBOT that can be move itself without continuous human guidance. The autonomous cleaner ROBOT system which can be consumes very less power on comparing with existing system. The existing system consumes very high power of 500W for suction whereas "Automatic and manual vacuum cleaning robot" required 10W for suction [3].



III SYSTEM ARCHITECTURE

A. ELECTRONICS SYSTEM:

This project will be able to do tasks like brushing, water jet, mopping, sucking at a time. We are using Bluetooth technology for an operation. The Blue control v2 app will be installed on an Android phone and will communicate with the Bluetooth module. For this configuration, the module needs to be set in the app. Once configuration is done, the work will get started. There are two sections: transmission and receiver. In the transmitter section, the robot will be operated manually where it will have to move like forward, backward, left and right side. In the receiver section, actions will be performed by switching the appropriate relays through the Atmega18 controller. The various components controlled in the receiver section for achieving the actions like vacuum cleaner, water jet, brushing.

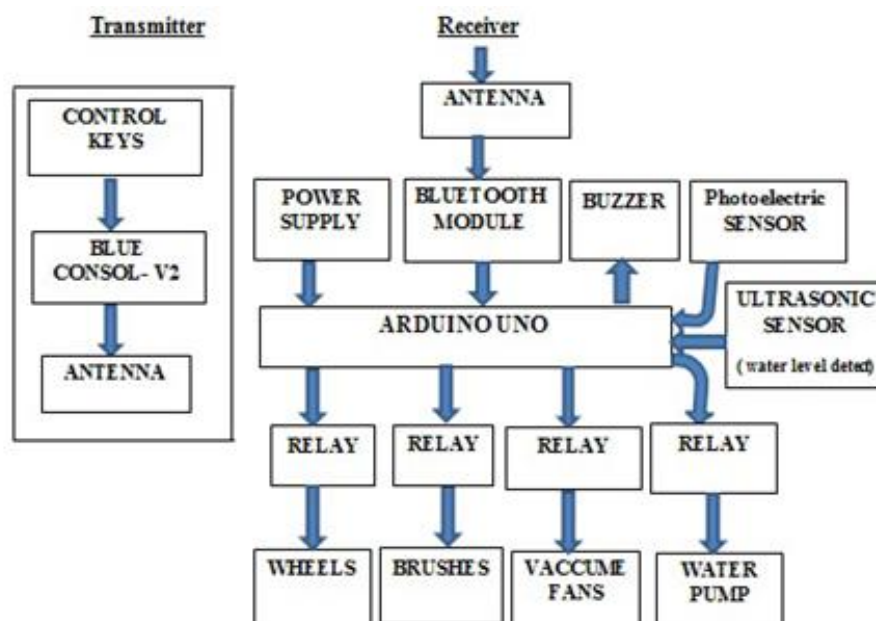


Fig. 1 Block Diagram

For obstacle detection, there will be a photoelectric sensor. This gives a signal to the controller if an obstacle is present, and the algorithm written in the controller will change the direction of motion of the robot.

Water level in the water tank supplying water for operation of the jet will be detected by an ultrasonic sensor. If the level drops below the specified level, a signal will be given by the system.

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.

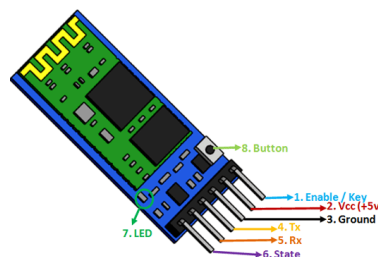


Fig. 2 Bluetooth Module

Buzzer:

The buzzer is a device which is used to produce a sound signal which indicates the completion of a particular task. The buzzer used in this device is a 5V buzzer.



In our Project Buzzer is used for sounding purpose when Robot detects the Obstacle at that time Buzzer plays a sound like Beep.

Photoelectric Sensor:

The sensor consists of two eyes. One eye sends the infrared light and the other eye sees the reflection of that infrared light and measures the distance which is then sent to the Arduino through analog input to perform further operations based on the distance. There are three wires coming from the sensor .i.e. Red, Black and White or it can be Red, Brown and Yellow. Red is connected to 5V of Arduino. Black or brown is connected to Ground of Arduino. White or yellow is connected to analog input pin of Arduino i.e. in this case to analog pin 0.



Fig. 3 Photoelectric Sensor

The sensor has a 3-pin header which connects to the microcontroller board or Arduino board via female to female or female to male jumper wires. A mounting hole for easily connect one or more sensor to the front or back of your robot chassis.

Because these sensors possess many variations depending on the sensing range, they enable you to make optimal volume adjustment easily.

Ultrasonic Sensor:

This sensor is a high performance ultrasonic range finder. It is compact and measures an amazingly wide range from 2cm to 4m. This ranger is a perfect for any robotic application, or any other projects requiring accurate ranging information.

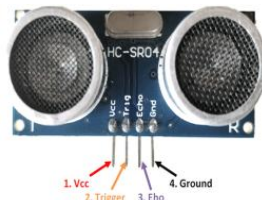


Fig. 4 Ultrasonic Sensor

ATmega328P

Atmega328P is an eight (8) bit Microcontroller. It can handle the data sized of up to eight (8) bits. It is an AVR based micro-controller. Its built-in internal memory is around 32KB. It operates ranging from 3.3V to 5V. It has an ability to store the data even when the electrical supply is removed from its biasing terminals. Its excellent features include the cost efficiency, low power dissipation, programming lock for security purposes, and real timer counter with separate oscillator. It's normally used in Embedded system applications.



Fig. 5 Atmega328P



B. Mechanical System:

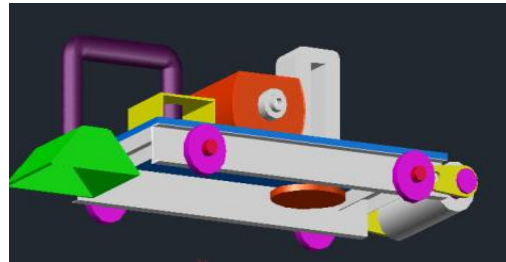


Fig. 6 Proposed System

Chassis of Robot: Chassis is the basic framework of the robotic mechanism. It supports all the parts of Mechanism attached to it. In our system chassis carries all the stationary loads attach to it. It should withstand vibration cause by the motion of Robot. Hence its design is the back bone of the system.

Motor Wheels: The complete product is a four wheel drive automation process. 4 wheels are independently connected to 4 different 12v DC motors. The purpose of the wheels is

1. To give proper motion.
2. Provide traction in surfaces.
3. Easy movement in all direction.
4. Avoid slip from its path.

Vacuum Cleaning: Vacuum cleaning process is used to clean the dust particles from the surface so that the load will be lessen for the purpose of other operation. This process is achieved by using a 12v DC vacuum pump. The inlet is divided into a number of holes so that dust all over the width can be sucked. In mechanical vacuum pumps the mechanism is so designed that air or liquid is sucked from closed area and being thrown to atmosphere.

Brushes:The robot consists of the climbing mechanism, the moving mechanism, cleaning brushes and the supporting mechanism. Brushing mechanism consists of one rolling brush, steel sheet for cover, two aluminum holders, two ball-bearing and one mild steel strip. One rolling brush mounted on aluminum holders with bearings inside them. This mechanism is attached through mild steel strip to the base of robot. Brush is used to broom the dirt particles into the vacuum chamber in case of carpeted floor for efficient cleaning. The side brushes on a robot vacuum are smaller and are used to pull debris into the main brushes reach. They need some extra care to keep working well. After a while you may notice that these brushes become warped and even tangled.

IV. CONCLUSION

This robot is specially made on the basis of modern technology. System has all the features which are required for a vacuum cleaner. It can work automatically and manually. It has the feature of the scheduling and it can auto drain itself. CLEAR has many competitors who are selling same product in high prices. This research clear the way for efficient floor cleaning with sweeping and mopping operations. An automatic water sprayer is used which sprays water for mopping purpose. User can also operate this robot manually with the help of remote. It reduces the labour cost and saves time also and provides efficient cleaning. In automatic mode, the robot operates autonomously. The operations such as sweeping, mopping and changing the path in case of hurdle are performed automatically. Nonetheless, there are still new ideas to improve the developed system and to add new functionality to it. Further, the robot can be made to move randomly in any direction and its speed can be controlled. It has a vacuum cleaning system which consume very less as comparing with other system. Power consumption will reduced greatly and hence the operating cost is very low.

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