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Robotic Vehicle For Cleaning and Surveillance

Manchukonda Gautham, Pothapala Vinodh
RMK Engineering College,
Corresponding Author: Manchukonda Gautham

Abstract: *With the help of this project, We can command a robotic vehicle to clean the surroundings and to monitor a specific area. A microcontroller is used together with a Bluetooth module for sensing the signals transmitted by an Android application using a Smartphone. This vehicle can be controlled remotely by using a smartphone which supports Android OS. The transmitting end uses an Android application through which the voice commands are transmitted to the Bluetooth module. The commands given by the user helps the vehicle to move in any of the four directions. The vehicle moves to a distance specified by the user through voice commands. At the receiving end, four motors are interfaced to the microcontroller where they are used for the movement of the vehicle. Commands can be sent to the microcontroller via manual button application or speech application. Ultrasonic sensor is used for obstacle detection. A camera module is used to know the surroundings and a GPS module is placed to know the exact location of the vehicle. A cleaner is attached to the vehicle for cleaning the garbage. Two android applications are designed to run the vehicle both with voice and manual control. In this way, the commands are actively taken and cleaning is effectively done.*

Technology Used - *Bluetooth, GPS Technology, Android Application , Solar charging Technology, Micro controllers like Arduino , Intel Edison, Raspberry pi*.

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I. INTRODUCTION

Our project involves two major parts.One is the embedded and the other is the android application. The embedded system involves components like intel Edison, Bluetooth module, Batteries, GPS module, DC motors, solar panels and ultrasonic sensor. We use intel Edison board for developing the entire embedded part. It is powered by the rechargeable batteries. We have used an Arduino UNO to test the ultrasonic sensor through which the distance between the object and vehicle can be found. This sensor helps us to know the exact distance between the bot and the obstacle.

The GPS module is another major module in this embedded technology. The configuration of the GPS is done in the Arduino programming part. The hardware module is placed in the front position of the robot so that the GPS location can easily be determined. The GPS links itself with the satellite with the help of the ceramic antenna and finds the latitude and longitude of the current location and determines the time from the original standard time (Greenwich time). The programming involves the sensing of the current location, timing and direction. With the help of these values the current location of the robot is determined and the values are sent with the help of the Bluetooth technology to the smart phone. The integration of GPS along with the embedded part has been tested successfully. The values are then sent to the android application for further processing.

The Bluetooth module that we used in this product is the HC 05 module. The Bluetooth is integrated along with the Arduino with the help of software coding part. It has been employed in the robot and tested successfully. The data obtained from GPS is sent at periodic time intervals to the android application with the help of Bluetooth module. The normal pairing code of Bluetooth module is '1234'. So that it is easily paired with the smartphone.

We have used L293D motor driver IC for driving the motors. The power given to the motors can either be the solar energy or batteries. The advantage of using this motor driver is reducing the power consumption.one half of the IC is used for one motor and the other half for the other motor so that both the motors run with constant speed as they are getting equal power and so we are reducing to half of the total power consumption.

DC motors are used to drive the vehicles. Using four 15000rpm motors, sufficient speed can be obtained. Once a voice command is given or a manual button is pressed in the android application, the Bluetooth module recognizes the string which is already pre dumped in the microcontroller and then sends commands to the L293D IC which further drives the dc motors by various digital bit combinations.00,11 means no rotation and 10,01 are used for forward and backward rotation of dc motors. One more DC motor is used with blade propeller is used for cleaning. We used a small blade propeller and a dc motor along with a bottle to clean the

dust. When the bottle has holes at the back, it sucks the air into it and a filter can be used amid to separate dust and propeller.

Team viewer is a Software used for remote control. We have used this software for surveillance application in our project so that we can control the mobile which is attached to the car. We can get the live video feedback and we can capture photos if necessary.

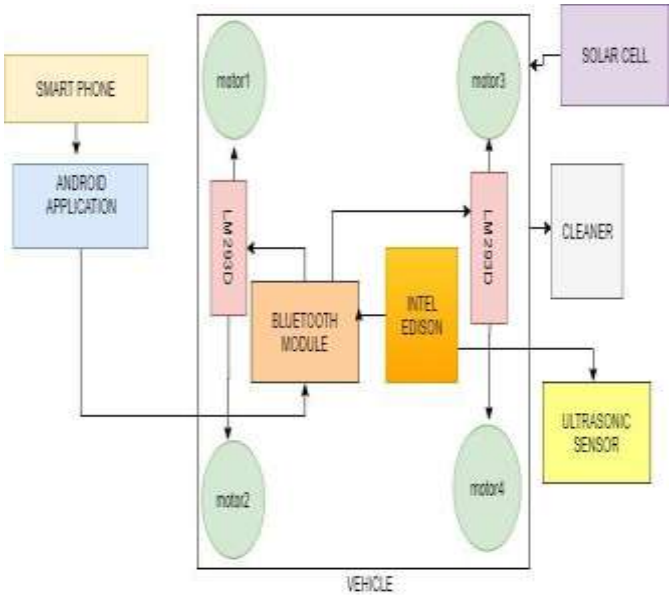
II. WORKING:

Working starts with the voice commands we give. When a voice command is given, the Bluetooth module accepts the command and passes on to the microcontroller which further gives a signal to input pins of driver IC and finally the motors start rotating. The commands we give should be included in the Arduino code we dump and according to the voice command given, the robotic car moves in any of the four directions. And by using the sensors we can find the obstacles and cleaner will start working by sucking the garbage into it and store it in a bin. If no garbage is present, cleaner automatically turns off and remains in off condition until the garbage is sensed while moving.

Table showing the rotation of motors for different digital input values:

Inputs And Motor Outputs					
A	***B***	***C***	***D***	**Motor1**	***Motor2***
1	***0***	***1***	***0***	***FWD***	***FWD***
1	***0***	***1***	***0***	***FWD***	***FWD***
1	***0***	***0***	***1***	***FWD***	***REV***
1	***0***	***0***	***0***	***FWD***	***STOP***
0	***1***	***1***	***0***	***REV***	***FWD***
0	***0***	***1***	***0***	***STOP***	***FWD***
0	***1***	***0***	***1***	***REV***	***REV***
0	***0***	***0***	***0***	***STOP***	***STOP***

Block Diagram:



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III. SIMULATION SOFTWARE:

Before proceeding with the project,Proteus Simulation software tool can be used to design the circuit and to make sure that there will be no more errors while the project is being done. This software is also used for PCB(Printed Circuit Board) layout Design and capture of schematic diagrams.

Purpose:

This project mainly emphasizes the problems faced by factories, national highways and railway stations.

Factories:

Now a days, factories are facing some major problems like cleaning and pipe leakages. As we know that it is not an easy task to know where the pipe is damaged, so this robot can be sent into the holes or the places where the humans cannot enter into.So, this problem can be identified quickly and the issue can be resolved as soon as possible. Waste accumulation can be eliminated by using this bot.

National Highways:

Day by day, a lot of garbage heaps are being accumulated on the sides of national highways and it is difficult for people to clean them because of continuous sprinting of vehicles. Hence, this problem can be overcome by using this bot.

Railway stations:

Accumulation of litter, junk and scrap between the railway tracks has turned into a major problem. Even though workers are assigned to clean the garbage between tracks, that takes a lot of time and effort. So, this can be used as a substitute to clean the garbage.

Market Overview and its Growth Potential:

- Now a days, many Companies are investing a lot of money for making robots (which are used for automation) because they complete the work quickly and more accurately than humans.
- Countries like Japan are manufacturing Robots and using them to a maximum extent in completing the works effectively.
- As India is also one of the countries which is manufacturing robots, introducing Robots with new kind of applications like cleaning will be very much useful.

Target customers:

- National Highway Authority of India
- Private Organizations
- Factories
- Railway Stations
- Indoors
- Government Hospitals

Problems facing in Real Time and their solutions:

Main Problems:

- Blocking of drainages leading to the accumulation of water on the roads.
- Damage of the pipes in the factories are unknown for a long period of time leading to wastage.
- Even though, a lot of manual scavenging is done, it is difficult for them to work in the rainy season.
- No proper usage of solar energy.

Solutions:

This bot detects the garbage and cleans it to the maximum extent thereby reducing the blockages, maintaining a perfect drainage system.

- Humans find it difficult to enter into small hollow spaces even though the problem is known, Then this bot comes into play in identification of problems and helps resolving them.
- In rainy season, scavengers find lot of difficulties to do their job. At that time, this bot can be utilized.
- As this bot is mostly used outdoors, Solar energy can be considered as a primary source.

Key Differentiator:
The key differentiator or the Uniqueness of this product are

- This uses the Smart phone application for navigation system such as Google maps.
- It can be used as a tracking device.
- It gives different perspective to the traditional Robots.
- Cleaning is the unique application.
- This bot uses the renewable solar energy.

Advantages:
1) This robotic car is small in size, so space required for it is less.
2) We can access the robot from the distance of meters.
3) Cost of the system is low.

Applications:
1) These robotic cars can be used in the where humans find difficult to reach.
2) Used to control and command appliances and equipment.
3) These can be used for monotonous works like cleaning.
4) These can also be used for surveillance.

Further Research:
- ✓ The power generated while rotating the wheels can be used to charge the device using piezo electric crystal.
- ✓ With further technology, the vehicle can be controlled over very large distances.
- ✓ In future, the vehicle can also be used in the underground.
- ✓ Further, it can be used in smart irrigation projects with an advanced feature of image processing.

IV. CONCLUSION

This system shows how the android smartphone can be used as remote controller for robot with the help of Bluetooth technology. The communication between

Smart phone and robot can be realized, which makes it simple and convenient to control the robot for useful Applications.

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