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Robot Based System for Cleaning Railway Tracks

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Abstract

The fact that humans have to clean human waste and other garbage thrown on rail tracks is a situation that needs immediate remedy. Manual scavenging is done now-a -days, owing to the peculiar nature of the job, and many who are engaged for this job suffer from related health problems. The prevailing condition can be rectified to some extent by the adequate use of robotics and control technology. The proposed idea of automatic railway track cleaning system comprises an automatic vehicle that goes on land and track. This device is the first of its kind proposed to be developed exclusively for the Indian Railways. Also, the railways can save a lot of money on water and labour charges. It has to accomplished some functionality critical in the waste clean-up in railway tracks, and have also tried to find solution for connected problems.

Keywords: Robotics, Automation, Railways, *Labour.*

I. Introduction

Track cleaning Robotics is a fascinating subject- more so, if you have to fabricate a robot yourself. The field of Track cleaning Robotics encompasses a number of engineering disciplines such as electronics (including electrical), structural, pneumatics and mechanical. The structural part involves use of frames, beams, linkages, axles, etc. the mechanical parts/ accessories comprise various types of gears (spurs, crowns, bevels, worms and differential gear systems), pulleys and belts, drive systems(differentials, castors, wheels and steering) etc. The pneumatics plays a vital role in generating specific pushing and pulling movements such as those simulating arms or leg movement. Pneumatic grippers are also used with advantage in Track cleaning Robotics because of their simplicity and cost effectiveness. The electrical items include DC and Stepper motors, actuators, electrical grips, clutches and their control. The electronic parts involves remote control, sensors (touch sensors, light sensor, collision sensor, etc), there interface circuitry and a microcontroller for overall control functions. Microcontroller used is AT89S52 form 8051 family to work in a serial communication UART mode the communication is configured on 9800bps to communicate it with the Bluetooth module. What we present here is an elementary robotic land rover that can be control remotely using primarily the RF mode. The RF remote control has the advantage of adequate range (up to 200m with proper antenna)

besides being omni directional. On the other hand, an IR remote would function over a limited range of about 5m and the remote transmitter has to be oriented towards the receiver module quite precisely. However, the cost involve in using RF modules is much higher than that of IR components and as such, we have included the replacement alternative of RF modules with their IR counterparts for using the IR remote control. The proposed land rover can move in forward and reverse direction. You will also be able to steer it towards left and right directions. While being turn to left and right, the corresponding blinking LEDs would blink to indicate the direction of its turning. Similarly, during reverse movement, reversing LEDs would be lit. Front and rear bumpers are provided using long operating lever of micro switches to switch off the drive motors during any collision. The decoder being used for the project has latch outputs and as such you don't have to keep the buttons on remote control pressed for more than a few milliseconds. This helps prolong the

battery life for remote. The entire project is split up into sections and each section is explain in the sufficient detail to enable you not only to fabricate the present design but also exploit this principles for evolving your own design with added functions. To keep your design as simple as possible, we have coupled a 30rpm geared 6v DC motor to the left front wheel and another identical motor to the right front wheel. Both these front motors are mounted side by side by facing in opposite direction. Wheel rims (5cm diameter) along with rubber wheels are directly coupled to each of the motor shafts. This arrangement does not require separate axles. During forward (or reverse) movement of the vehicle, the two wheel shafts, as viewed from the motor ends, would move in opposite directions (one clockwise and the other anticlockwise). For reversing the direction, you simply have to reverse the DC supply polarity of the two motors driving the respective wheels. There are different methods available for steering a robotic vehicle. The commonly used ones are:

1. Front wheels are used for steering, while rear wheels are used for driving eg. Tractors.

2. Front wheels are used for steering as well as driving eg, in most light vehicles. In these vehicles (such as cars), the front wheels are coupled using a differential gear arrangement. It comes into play only when one wheel needs to rotate differentially with respect to their axes.

II. Control logic

ATMEGA16

AT - It stands for the company that produced the microcontroller, **ATMEL.**

Mega - Stands for the family of Microcontroller. The other families from Atmel are Tiny & X-Mega.

16 - Stands for the **16KB** flash memory that is present in the microcontroller.

The **AVR** is a 8-bit RISC single chip microcontroller which was developed by Atmel in 1996. The AVR was one of the first microcontroller families to use on-chip flash memory for program storage, as

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opposed to one-time programmable ROM, EPROM, or EEPROM used by other microcontrollers at the time.

CMOS RISC, AVR ATmega16, 8-BIT Microcontroller, In-system Programmable with Flash code storage, re-programmable up to 1000 times. Features 32 working registers, single clock cycle execution giving up to 1MIPs/MHz.

ATmega16 Features

- 16K BYTES of In-System Programmable Flash
- 512 BYTES of In-System Programmable EEPROM
- 1K Bytes SRAM
- Analog Comparator
- Watchdog
- SPI
- 2 8-bit Timers plus prescaler
- 16-bit Timer with extra features
- 4 PWM
- 8 channel 10-bit ADC
- UART
- SPI
- 2-wire byte orientated serial interface
- Low power and Idle modes, External and External interrupts, selectable on-chip Oscillator

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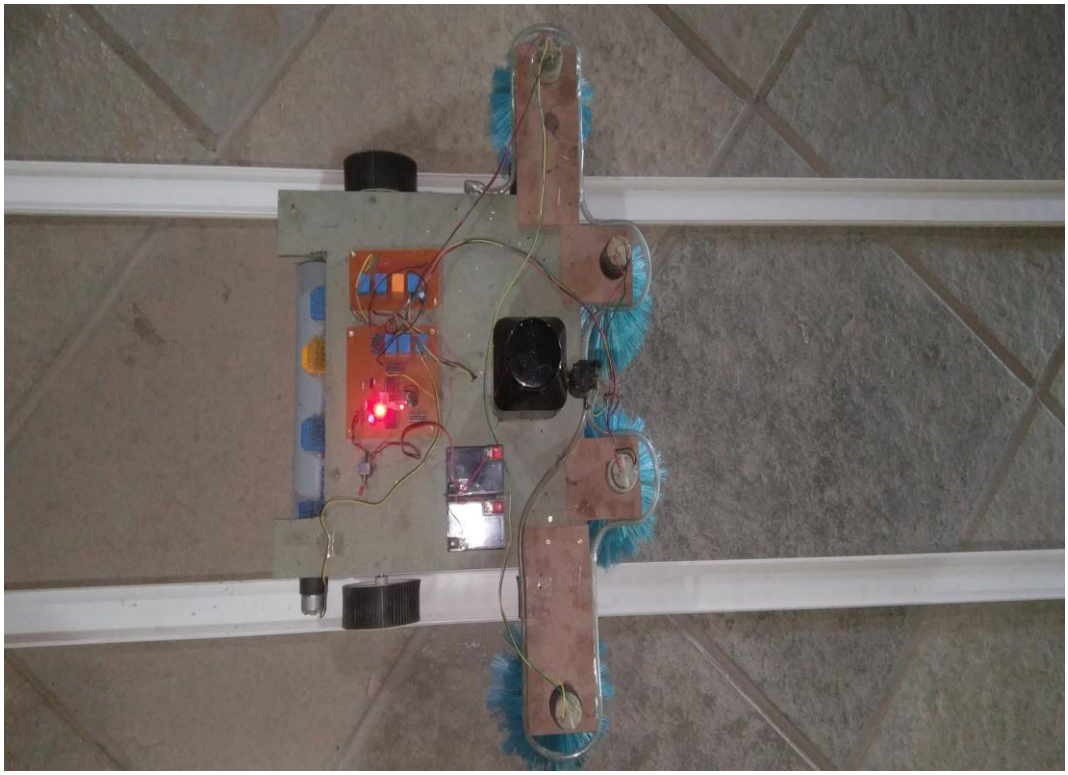

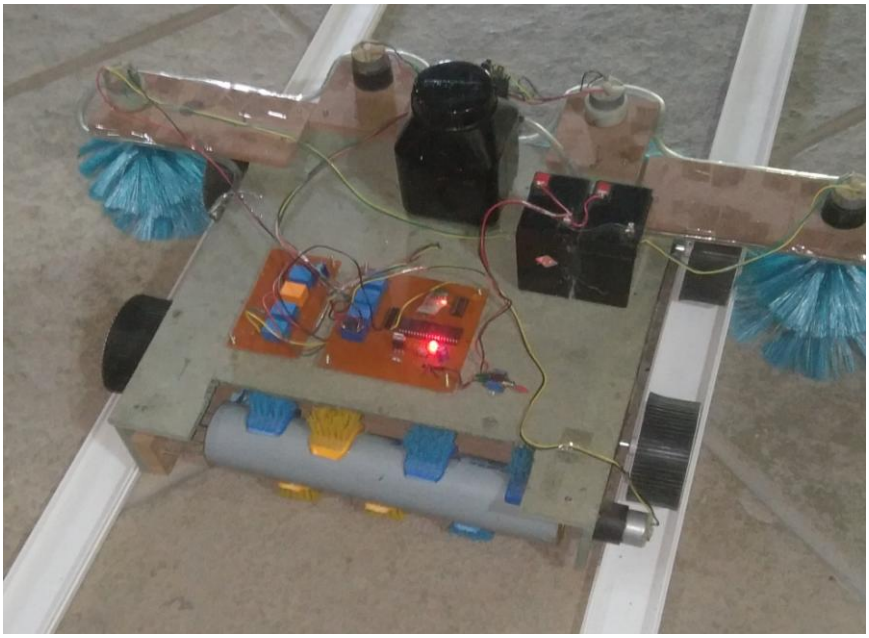

III. Flow Diagram

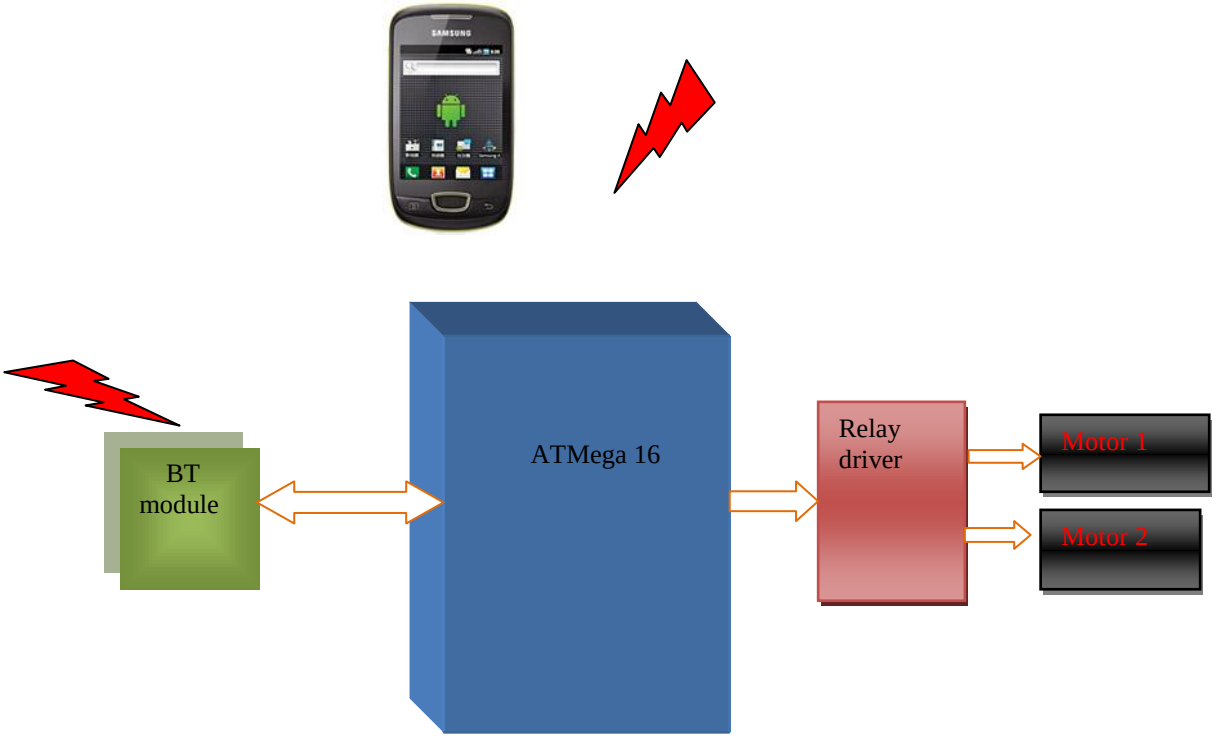

Figure2. Circuit Diagram for Bluetooth module

The mechanical assembly of the rover is followed by proper placement of battery (6V, 4Ah), mounting of PCB and finally plugging the connector from the battery, motor and various LEDs mounted on the rover into the corresponding connector on the PCB before being able to control various motion of land rover remotely using either RF or IR principles-by simply shifting the jumpers in the remote transmitter and receiver PCBs towards appropriate position. Here are some useful hints and sequence for successful assembly of the land rover:

IV. Conclusion

The future developments of Robots can be found in various places. The major among them is in the field of Development is going in the field of artificial intelligence. This will invoke thinking in Robots which in future will help Man kind in problem solving. Development is going on in the field of nano system which

deals with implanting of small chips into human body for early detection of diseases. This can also help in locating a person by GPS technology.

REFERENCES

[1] Dr. Manoj Hedaoo, Dr. Suchita Hirde , Ms. Arshi Khan, **"**Sanitation in indian railway premises: a great cause of concern**"** , International Journal of Advanced Engineering Technology, 2015

[2] Dr. Aparajita Baruah, The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013: A Review, Baruah. Space and Culture, India 2014.

[3] http://www.nr.indianrailways.gov.in/view_detail.jsp?lang =0&dcd=3591&id=0,4,268

[4] http://www.railwaystrategies.co.uk/articlepage.php?conte ntid=2196&issueid=103

[5] Mr. Rajesh Pant, Mr. Mayank Uniyal, Mr. Prashant Ratodi **"**Manual Scavenging and Technological Solution to Eradicate It. (Turning Scavengers to Engineers)**"**, IOSR Journal of Mechanical and Civil.

[6] E. Prassler, E. Stroulia, M "Office Waste Cleanup: An Application For Service Robots" Strobe1Research Institute for Applied Knowle Processing P.O. Box 2060,D 89010Ulm,Germany{ prassler,stroulia,mstrobel} @faw.uni-ulm.de

[7] Tarek Mohammad **"**Using Ultrasonic and Infrared Sensors for Distance Measurement**"** by International Science Index, Mechanical and Mechatronics Engineering Vol:3, No:3, 2009 waset.org/Publication/6833

[8] **"** A new Home Robot Positioning System (HRPS) using IR switched multi ultrasonic sensors" by Saeed Shiry Ghidary, Takahiro Tani, Toshi Takamori, Motofumi Hattori Dept. of computer and systems engineering, Fac. of Engineering, Kobe University,