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An Automated Pollution Free Vehicle for Smart Transportation

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ABSTRACT: To reduce air pollution car manufacturers consider today various alternatives: manufacturing of electrical cars, the creation of new environmentally friendly fuels (Sovacool 2010). Unfortunately, today the reality is that cars do pollute. Even though manufacturers try to reduce this problem, people behind the wheel are also responsible for creating a better future for themselves and their children. The solution to environmental degradations involves unselfish and compassionate behaviour, a scarce commodity.

In this, we design an automatic pollution free vehicle for smart transportation, due to increase in pollution and increase in population of vehicles in many metro cities increases traffic jams, time consuming and stress to the people driving to many works in day to day life. So to reduce all the above said problems, we developed a pollution free vehicle for better and ease of transportation.

Initially if we want to introduce this vehicle in the area of traffic jams it is very difficult to design this automatic system hence we developed an layout in which all the amenities are available a layout which is free from pollution, hence this automatic vehicle can automatically pick up and drop the passengers from source to destination, once it is requested using GSM technology and RFID's to track the shortest route to the destination.

The other aspect of this Paper is to intelligently detect accidents and upload information to the cloud which could be accessed by authorized people as the situations are, so that necessary fines could be levied.

KEYWORDS: GSM technology, RFID's, automatic pollution free vehicle.

I. INTRODUCTION

This Paper describes the development of new control strategies and models for AN AUTOMATED POLLUTION FREE VEHICLE FOR SMART TRANSPORTATION. The Automated pollution free vehicle is necessary because of the following reasons.

The main causes of pollution are due to vehicles and Emitting Hazardous pollutants into the atmosphere and secondly due to the emission of exhaust gases during manufacturing process in industries.

Experts predict that by 2030 the number of cars will reach 2.2 billion. Today cars are already major source of emission, with negative effects on the environment and health. Cars emit tons of pollutants in the air every day. Ground level Ozone (O₃) produces smog (causes visibility and lung medical problems).The carbon dioxide and monoxides which are the pollutants of vehicular emissions are the main causes for global warming.

Upon all these there is lot more traffic jams due to poor traffic systems in the major Metropolitan cities in India. Many foreign Industries namely cloud based technologies are trying to aid and develop an intelligent traffic system to curb city pollutants and improve living standards.



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On considering all the conditions to reduce air pollution car manufacturers and people behind the wheel are also responsible for creating a better future for themselves and their children, hence there are on their way in creating various alternative such as :

First and foremost is the Hybrid Electrical Vehicle (HEV), this vehicle is the combination of Internal Combustion Engine (ICE) and the electric motor.

Secondly the electric vehicle which runs on purely electric motor using robotic technology as described below.

PROBLEM DEFINITION:

For the generations smart vehicles are necessary, because pollution free, safety, traffic jams and time management is important in the corporate world, so this Paper is proposing a smart vehicle using the latest automatic robotic technology for picking up the passengers from source to required destination automatically.

OBJECTIVE:

- Optimizing the layout structure considering all the parameters and for the ease of transportation.
- The automated vehicle runs on electric batteries/solar batteries .The vehicle is designed to drive without a driver automatically to pick up the person from source to the destination.
- Since the vehicle is automatic and drives purely on electricity making it environment friendly and hence pollution free.

II. AUTOMATIC POLLUTION FREE VEHICLE

- An autonomous car (also known as a driverless car, auto, self-driving car, robotic car) is a vehicle that is capable of sensing its environment and navigating without human input many such vehicles are being developed, but as of May 2017 automated cars permitted on public roads are not yet fully autonomous. They all require a human driver at the wheel who is ready at a moment's notice to take control of the vehicle.
- Among the potential benefits of autonomous cars is a significant reduction in traffic collisions the resulting injuries; and related costs, including a lower need for insurance. Autonomous cars are also predicted to offer major increases in traffic flow enhanced mobility for children, the elderly disabled and poor people; the relief of travellers from driving and navigation chores; lower fuel consumption; significantly reduced needs for parking space in cities a reduction in crime and the facilitation of different business models for mobility as a service, especially those involved in the sharing economy.
- Among the main obstacles to widespread adoption of autonomous vehicles, in addition to the technological challenges, are disputes concerning liability; the time period needed to turn an existing stock of vehicles from non-autonomous to autonomous; resistance by individuals to forfeit control of their cars; consumer concern about the safety of driverless cars; implementation of legal framework and establishment of government regulations for self-driving cars; risk of loss of privacy and security concerns, such as hackers or terrorism; concerns about the resulting loss of driving-related jobs in the road transport industry; and risk of increased suburbanization as driving becomes faster and less onerous without proper public policies in place to avoid more urban sprawl. Many of these issues are due to the fact that Autonomous Things such as autonomous vehicles (and self-navigating drones) are allowing, for the first time, the computers to roam freely, with all the related safety and security concerns.
- If a human driver isn't required, automated cars could also reduce labour; relieve travellers from driving and navigation chores, thereby replacing behind-the-wheel commuting hours with more time for leisure or work; and also would lift constraints on occupant ability to drive, distracted and texting while driving, intoxicated, prone to seizures, or otherwise impaired. For the young, the elderly, people with disabilities, and low-income citizens, autonomous cars could provide enhance mobility.

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Working Principle:

- The EV was mainly converted from the existing ICEV by replacing the internal combustion engine and fuel tank with an electric motor drive and battery pack while retaining all the other components, as shown in Figure3 Drawbacks such as its heavy weight, lower flexibility, and performance degradation have caused the use of this type of EV to fade out.

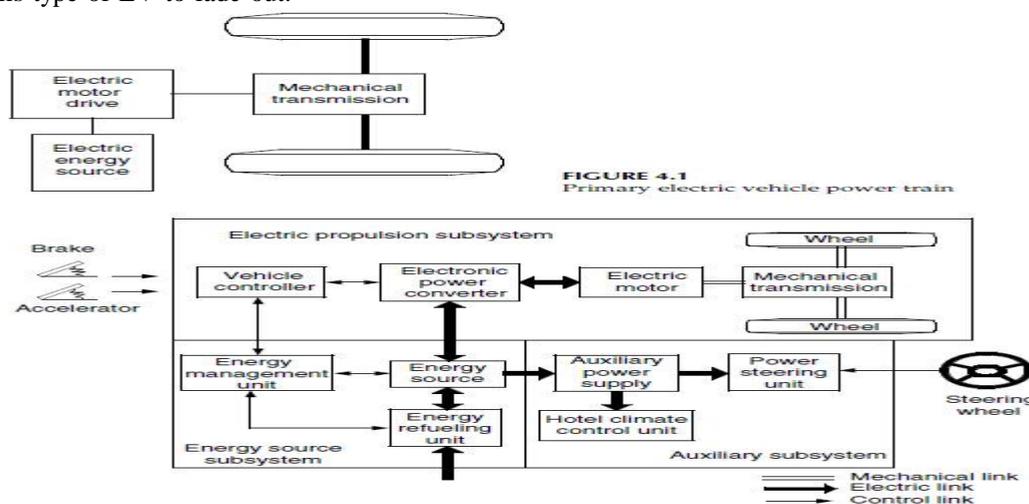


Fig1: Electric Propulsion system

- In its place, the modern EV is built based on original body and frame designs. This satisfies the structure requirements unique to EVs and makes use of the greater flexibility of electric propulsion.
- A modern electric drive train consists of three major subsystems: electric motor propulsion, energy source, and auxiliary.
- The electric propulsion subsystem is comprised of a vehicle controller, power electronic converter, electric motor, mechanical transmission, and driving wheels. The energy source subsystem involves the Energy source, the energy management unit, and the energy refueling unit. The auxiliary subsystem consists of the power steering unit, the hotel climate control unit, and the auxiliary supply unit.
- Based on the control inputs from the accelerator and brake pedals, the vehicle controller provides proper control signals to the electronic power converter, which functions to regulate the power flow between the electric motor and energy source. The backward power flow is due to the regenerative braking of the EV and this regenerated energy can be restored to the energy source, provided the energy source is receptive. Most EV batteries as well as ultra capacitors and flywheels readily possess the ability to accept regenerated energy. The energy management unit cooperates with the vehicle controller to control the regenerative braking and its energy recovery. It also works with the energy refueling unit to control the refueling unit, and to monitor the usability of the energy source. The auxiliary power supply provides the necessary power at different voltage levels for all the EV auxiliaries, especially the hotel climate control and power steering units.

III. BLOCK DIAGRAM WITH ITS EXPLANATION

Optimizing the layout structure considering all the parameters and for the ease of transportation. A layout is designed such that all the amenities like housing, schools, hospitals, companies and Markets etc., are under one layout, Framing a zero percent pollution layout.



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- These electric vehicles are introduced to be used for the transportation inside the locality.
- The vehicles are designed in such a way that it achieves the flexibility in achieving the ease of transportation for the people from source to destination and achieving 0% pollution into the atmosphere.

The control strategy of the vehicle is achieved as follows:

- The vehicle is framed in such a way that it is embedded with controller and follows the master slave protocol to reach the location of the requested source passenger.
- The path is pre determined by the controller with its GPS and frames the shortest path between sources to destination.
- Once the path is framed. The RFID's and compass sensors are designed to control the flow and direction of the vehicle.
- Using RFID'S and the controller Path, the vehicle reaches the destination, by meeting the passenger's requirements and safety.
- This automated pollution free vehicle reviews that person travelling from one place to another Travels stresslessly and effective, as it is automated.
- Due to electric motor driving the vehicle the emission parameters are highly reduced, forming the 0% pollution locality. The only parameter which affects the environment is the heat dissipation from the vehicle and can be reduced by using various techniques and by planting trees around roadsides, so that the trees would observe the heat.
- To demonstrate an automated pollution free vehicle for smart transportation, considering efficiency & control strategy of the sample robotic vehicle with the following parameters is chosen.
- ARM7 LPC 2148, LCD DISPLAY, KEYPAD GSM / ZIGBEE, H-BRIDGE, RFID READER, DC MOTORS, COMPASS SENSORS.
- The various parameters for the control strategy are entered and implemented and are shown in the below block diagram and map layout.

The map layout described below is not the original map it is just the small description about how a robotic vehicle that can be used for the transportation from one place to another. The below map shows a clear picture of how the vehicle can be used for transportation and this layout is for understanding & briefing purpose

- Vehicle in parking place[A kind of Bus stop]
- Vehicle should pick person from source[once it is requested]
- Once the person is inside the robotic vehicle give an indication that the person is inside[indication of light from red to green]
- Start the trip from source to destination [using shortest path, g2 cross logic etc...]
- Once the vehicle reaches the destination should give an indication that the person has got down.[indication of light from green to red]
- The main intension of building this vehicle is to reduce the pollution as it is electric and reduce the stress while driving automatic reduces the traffic jams.
- The destinations have to be represented the hospitals, schools, a company etc; at least minimum two destinations have to be represented.

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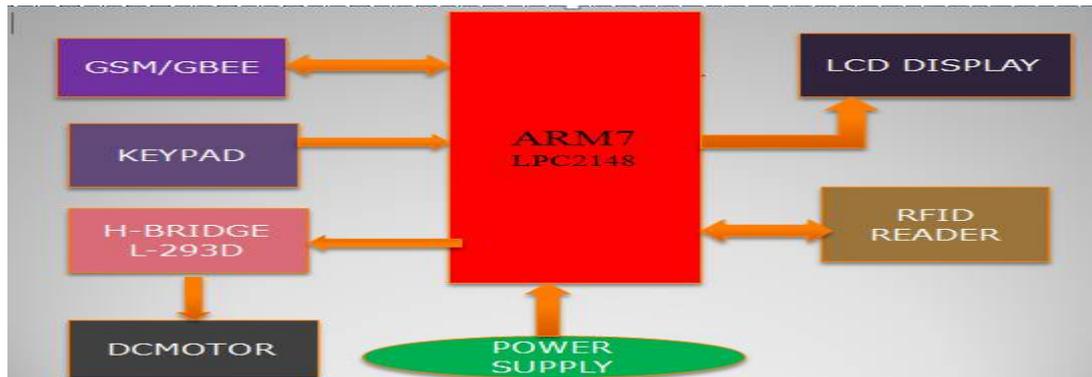


Fig2: Block Diagram of Robotic Vehicle.

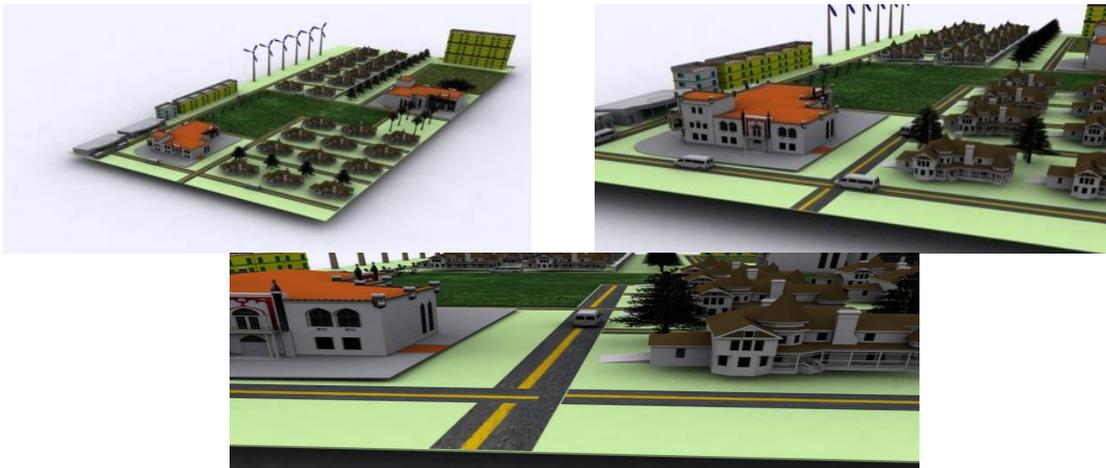


Fig3: Represents the layout with robotic vehicle stop point ,location houses, companies etc.,

IV. HARDWARE DESCRIPTION

H-Bridge

How do we make a motor turn?

You take a battery; hook the positive side to one side of your DC motor. Then you connect the negative side of the battery to the other motor lead. The motor spins forward. If you swap the battery leads the motor spins in reverse.

Ok, that's basic. Now let's say you want a Micro Controller Unit (MCU) to control the motor, how would you do it?

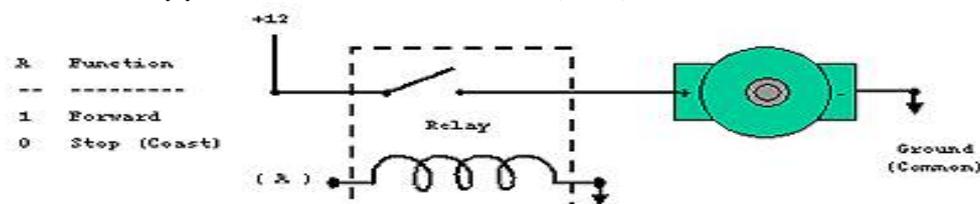


Figure4: Connections for clockwise rotation of motor



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If you connect this circuit to a small hobby motor you can control the motor with a processor (MCU, etc.) Applying a logical one, (+12 Volts in our example) to point A causes the motor to turn forward. Applying a logical zero, (ground) causes the motor to stop turning (to coast and stop).

Hook the motor up in this fashion and the circuit turns the motor in reverse when you apply a logical one (+12Volts) to point B. Apply a logical zero, which is usually a ground, causes the motor to stop spinning.

If you hook up these circuits you can only get the motor to stop or turn in one direction, forward for the first circuit or reverse for the second circuit.

You can also pulse the motor control line, (A or B) on and off. This powers the motor in short burst and gets varying degrees of torque, which usually translates into variable motor speed.

But if you want to be able to control the motor in both forward and reverse with a processor, you will need more circuitry. You will need an H-Bridge.

An H-bridge is an electronic circuit which enables a voltage to be applied across a load in either direction. These circuits are often used in robotics and other applications to allow DC motors to run forwards and backwards. H-bridges are available as integrated circuits, or can be built from discrete components.

Let's start with the name, H-bridge. Sometimes called a "full bridge" the H-bridge is so named because it has four switching elements at the "corners" of the H and the motor forms the cross bar. The basic bridge is shown in the figure to the right.

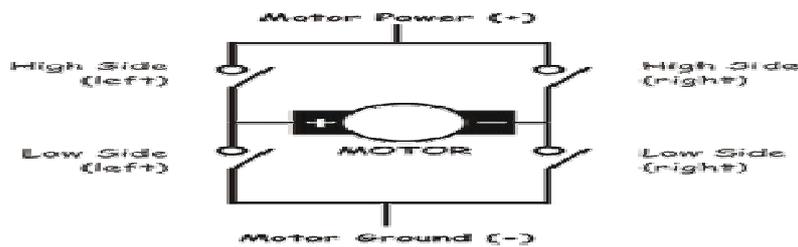


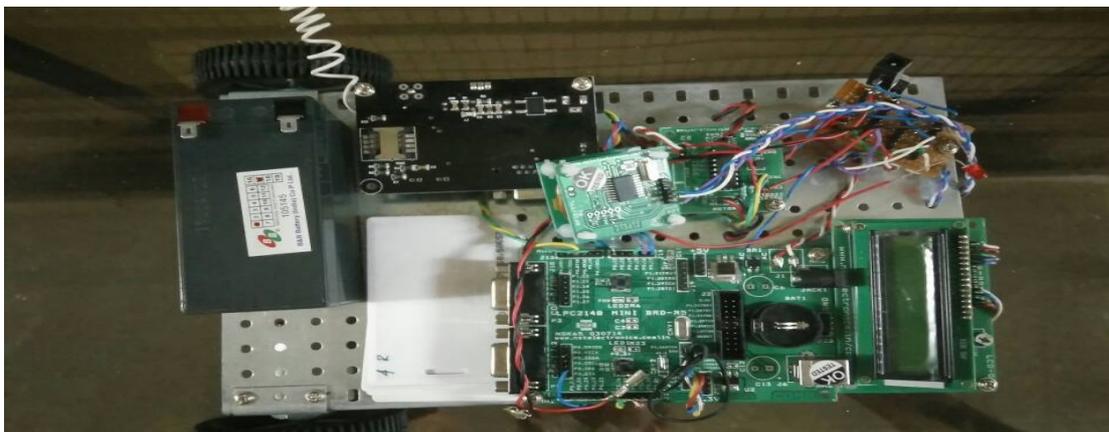
Fig5: Basic H-bridge

The key fact to note is that there are, in theory, four switching elements within the bridge. These four elements are often called, high side left, high side right, low side right, and low side left (when traversing in clockwise order).

V. RESULT AND DISCUSSION

EXPERIMENTAL SETUP:

IN THIS PAPER A MODULE IS DEVELOPED AND IMPLEMENTED AS DESCRIBED BELOW:





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The automatic pollution free vehicle is designed as shown below which drives the vehicle with battery and driving it automatically using the ARM7 processor. GSM based technology which sends the SMS when vehicle is ready to drive “welcome to vehicle”.

The destination for the vehicle is sent through SMS through codes. Once the code is received the vehicle starts moving to the destination by processing the RFID’s sequence. Once the destination is reached, it sends back the SMS “DESTINATION IS REACHED”.

RESULT ANALYSIS

This Paper mainly deals with the three problems. It consists of pollution free vehicle in the layout which is free from pollution. The layout consists of all the amenities, like hospitals, schools, companies, etc., a person can travel in the locality freely without any traffic jams as the vehicle drives automatically reducing driving stress. The vehicle is designed in such a way that it runs on electric batteries hence making the environment pollution free. Allowing the ease of transportation as the layout is well planned with all the amenities. Hence the person can move freely from one place to another without problems. This vehicle can be used in huge factories where large amount of goods can transported from one place to another. Hospitals where a patient has to be shifted from one place to another.

VI. CONCLUSION

In this Paper developed smart vehicle using batteries and ARM7 processor gives the solution to the reduced traffic jams and hence pollution free, accident avoidance & can travel effectively during emergency situations. This lead to less time consuming during travelling and less stress full, and also implementing on normal roads for reducing traffic as it drives automatically from one place to another effectively as increasing in population increases more & more vehicles, hence by implementing these kind of vehicles will reduce the effect of vehicular population and hence the pollution.

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