

E-Highway

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Abstract-Highways are one of the important and rising parts of modernized world which heavily influence the development of country's economy. The transportation sector of any nation depends upon the non-renewable sources like fossil fuels, coal, petroleum and natural gases. The use of fossil fuels also contributes for the green house gases emission. Vehicle using fossil fuels releases harmful gases into the atmosphere which increase the pollution index. So the release of harmful gases must be restricted and the existing transportation system must be replaced with a more sustainable transportation alternative. The alternative for the petroleum based road transportation is the introduction of E-Highways with electrical vehicle. This paper aims at constructing a overhead power cables to get electricity to power grid so as to charge the battery. This technology not only reduces fuel consumption but also reduce local air pollution. As there is a increasing demand for electric vehicles, the existing electric vehicle uptake has been limited due to their high purchase cost, limited battery range and inconvenience in charging. A solution to overcome this challenge is to have technologies that allow vehicle to charge while in motion. This project aims at constructing a highway where large trucks and vehicles with pantograph on their top are connected to the overhead power cables to get electricity to power grid so as to charge the battery. This technology not only reduces fuel consumption but also reduce local air pollution.

house gases and contributes to the healthy environment. One of the main advantage of this innovation is that it saves the time of charging that is it will charge the battery of the vehicle while moving. It is one of the significant step to increase the transport facility while reducing the usages of fossil fuel. For this the contribution of transport sector in the field of pollution must be controlled. E-highway is one of the significant step towards the overcoming of these challenges. Our focus is to electrify the roadways and to combine the electrified roadways with the flexibility of truck into an innovative freight traffic solution to reduce global warming, emission of green house gases and degradation of ecosystem.



Figure 1: E-highway.

Keywords: green house gases; E-highways; Electrical vehicle. pantograph; power grid; vehicle charging.

1. INTRODUCTION

Transport sector in world contribute approximately about 23% of total air pollution and largely depends upon the non-renewable resources. This sector is fossil fuel dependent and produces green house gases. As the demand for vehicles increasing day by day and it is also expected that the global emission due to transport sector will grow from 1.36 gigatons of carbon dioxide in 2015 to 2.40 gigatons in 2050.

One of the important challenge of any country is to make their environment pollution free. Electric-road trucks are fitted with overhead electric lines. The e-highway is twice efficient to the conventional combustion engines and provide reliable services with less impact on environment. This innovation supplies trucks with power from an overhead contact line. This reduces emission of green

2. Block Diagram

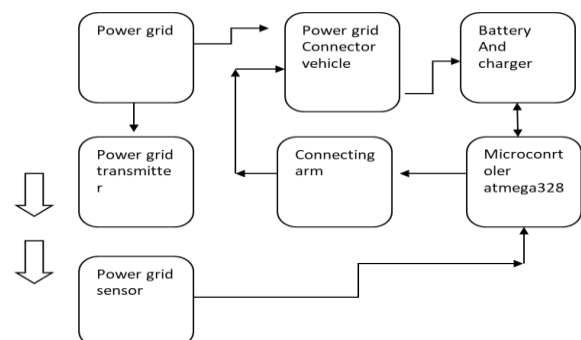


Figure 2. Block Diagram

Figure 2 shows block diagram of E-Highway which are explained as follows:

- i. A power grid is an interconnected network consisting of generating stations that produce electric power for delivering electricity from producers to consumers.
- ii. Power grid sensor: For remote monitoring of equipment such as transformer and power lines, power grid sensor is required. In this project we are using battery for delivering power to each sensor.
- iii. Microcontroller: 8-bit microcontroller is used to enable the servo motor to connect the pantograph to the overhead electrical lines to charge the battery.
- iv. Connecting arm or pantograph: Pantograph is responsible for transmitting power from overhead electrical lines to vehicles. Pantograph can be operated either automatically or manually by using push button. This enables the pantograph to be easily connected or disconnected from the overhead cables at speeds ranging from 0 to 90 kilometres per hour.

3. WORKING

In this work, transmitter and receiver circuit is used. Both circuits are connected with each other by Wireless (RF) communication. Working of each circuit is as follows,

3.1 Transmitter

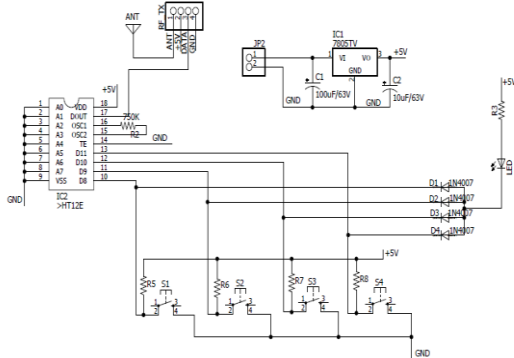


Figure 3(a):Transmitter

Vehicle motion will be controlled by the switches. Vehicle will move forward and backward with help of the push to switches of transmitter circuit. Switches are connected to the IC HT12E. This IC takes the output from the switches and gives it to the RF transmitter module. RF transmitter module works on frequency 433MHz. whenever we press any switch this data will send to the RF receiver by the RF transmitter. The whole transmitter circuit required 5v supply, therefore use 7805 IC to get proper 5v supply to all(IC, RF transmitter).

3.2 Receiver

At receiver side we are using RF receiver HT12D, L293D and microcontroller ATMEGA328. RF receiver will receive incoming data from the RF transmitter and gives it to the HT12D IC. HT12D gives its output to the L293D. L293D is the motor driver IC. This will drive the DC motors we used

for Vehicle demonstration. According to the input data from RF transmitter, the direction of the vehicle can be controlled.

While vehicle is moving, IR sensor will wait for the overhead electrical lines to start. When lines detected, controller will turn on the Servo motor. With the help of this servo motor, battery charger connector will connect to the supply lines. Battery charger circuit will start getting electricity from lines and converts it to charge the battery; Microcontroller keeps monitoring the battery level. With this battery monitoring power charging and life of the battery will be maintained. Our circuit will control the over and under charging of the battery. When microcontroller detects the end of the electric line, it will operate the servo motor to take back the battery connectors from the electric line.

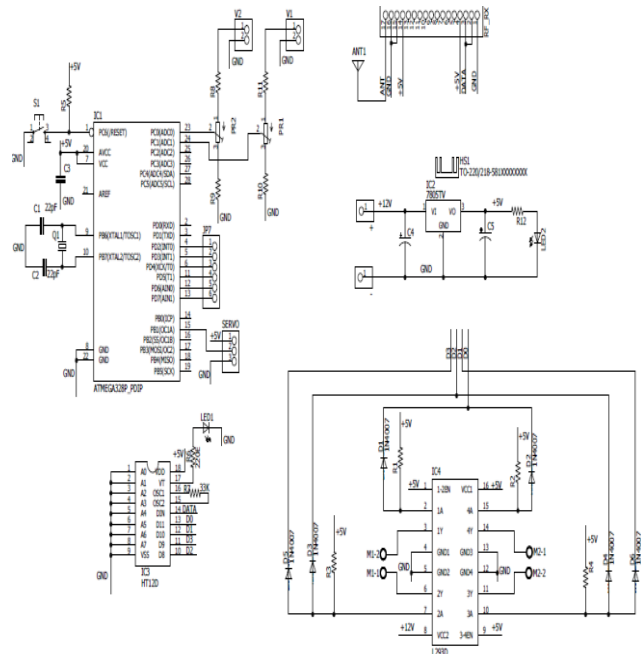


Figure 3(b): Receiver

4. APPLICATIONS

4.1 Shuttle transport

Routes such as from ports to freights and distribution centre are heavily used by the truck and contributes to co2 emission .By employing e-highway system between the two fixed point we can have significant reduction in pollution and co2 emission. E-highway can be a fruitful solution for high frequency shuttle transport for medium and short distances in the range of less than 50 kilometre. This will also lower the fuel consumption and allow longer lifetime.

4.2 Electrified fright transport in mines

For sustainable, clean and economical mine operation we can use e -highway to connect pits and mines to the warehouses, transhipment points and processing points.

The economical benefits that the e-highway system provides can be calculated on the basis of transport volumes. Thus E-highway can be efficiently used for connection of pits and mines to storage location.

5. ADVANTAGES

E-highway offers

- A. High energy efficiency and reduced operating costs
- B. Independence from fossil fuels
- C. Easy integration along existing roads
- D. Reduction of CO2 emissions
- E. A variety of hybrid configurations and alternative fuel technologies.

6. RESULT



Figure 4: E-highway

As a result of this project we are able to design a electrified roadways which saves time as well as eliminate the emission of harmful gases. The above figure shows the demo of vehicle where pantograph connect and disconnect itself by sensing the electrical overhead cable through IR sensor. The three LED levels are used to show the charging status of battery. Currently this project is for bulky transport but in future this technique can be implemented for small vehicles also.

7. FUTURE SCOPE

E highway project is currently controlled by human to move the vehicle and for charging and discharging purpose. But with further advance in technology in future this technique can because with automatic driving system. It will move the vehicle and charge the battery automatically without any human intervention.

8. CONCLUSION

The idea behind the e-highway system is to increase the efficiency of electrified trucks and increasing the nation's

economy by reducing the use of fossil fuel. It is concluded that we don't need to wait for the power stations to charge the battery but one can charge it while moving .in this project a battery monitoring system is used to protect it from overcharging. It also reduces the long haul traffic. This technique is ideal for bulky transport.

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BIOGRAPHIES



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