# SOLAR HI-TECH HIGHWAYS

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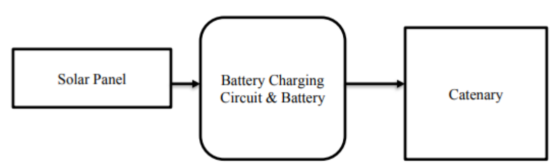
**ABSTRACT:** There are numerous ways that vehicle pollution affects people. This kind of pollution impacts numerous other parts of the environment in addition to simply one. It is just not going to happen that vehicle pollution will be eliminated. Alternatively, alternative methods of preventing vehicle pollution have been tried. The paper demonstration model is powered by a DC motor and built as a four-wheel chassis (vehicle). The electrical structure that is propelled by appropriate electromechanical components to make contact with the e-highway line will be lifted once the start button is hit or the command is given to the Bluetooth. The Driving the car through the battery demonstrates the diesel propulsion system of the vehicle. After the e-highway mechanism is activated, the car is powered by the e-highway lines instead of the battery, which was previously attached to the motor. The e-Highway car will automatically switch to its diesel hybrid drive system wherever there is no overhead line. This implies that they have the same flexibility and general applicability as traditional vehicles. The electrical car goes in the following directions: forward, backward, right, and left. It operates using Bluetooth orders. Through the battery, energy is extracted from the electrical source. Through the use of a catenary, the solar energy from the solar panels will be fed into the electrical vehicle, taking over from other vehicles or objects. The voltage coping will be used to control speed.

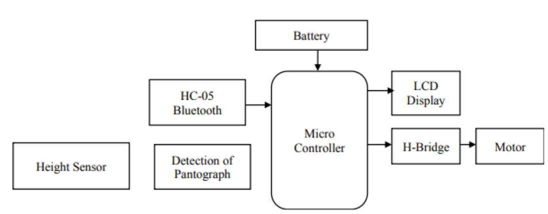
**KEYWORDS: VEHICLES, DC MOTOR, HIGHWAYS, SOLAR, BLUETOOTH.**

**I.INTRODUCTION:** With most major auto manufacturers now actively developing electric vehicles, the drive towards a zero-emission personal electric transportation future seems very much on the horizon. Road pollution doesn't just come from cars of course; freight vehicles are also major players in choking our highways and byways [4]. Siemens is currently testing a possible solution in Germany that's based on proven railway and tram technology but has been adapted for trucks on roads. Heavy goods vehicles have been fitted with a newly developed pantograph that can automatically rise to meet overhead cables and transfer electric power to hybrid electric power trains [1]. Energy recovered from regenerative braking can also be fed back into the system for re-use by other vehicles. The hi-tech Highway concept is a two-part system. The first involves the rollout of a two-pole catenary system along one or more lanes on freight transport routes that cater for two-way electricity transmission and ensure a reliable power supply by feeding the overhead wire via container substations [1]. The substations used in the current test paper feature a medium-voltage DC switching system, a power transformer, a rectifier and a controlled inverter (for the feedback of the electric energy generated by regenerative braking for real time). The field trial in Germany is reported to have confirmed full performance potential, independent of weather, conditions and load. The concept proved to be at least as flexible as existing fuel-based road freight transport solutions thanks to the maneuverability of the mobile pantographs, with reduction in carbon dioxide, nitrogen oxide, soot and noise pollution and added fuel efficiency benefits [2]. Keeping up with the flow of traffic doesn't appear to have been a problem either, with speeds of up to 90 km/h (55 mph) being reached without difficulty under direct transmission of electric power. For the first time ever, electric trucks powered by overhead cables will run to reduce carbon dioxide emissions. The hi-tech-highway electrifies selected traffic lanes using an overhead cable system. As a result, trucks can be supplied with electricity in the same way as trams and controlling through the Bluetooth [1],[3]. The "e-trucks" are equipped with a hybrid drive system and intelligent current collectors. Powered by electricity from overhead cables, they produce no emissions when operating in the local area.

**II.PROPOSED SYSTEM:** The block diagram of an E-Highway typically includes components such as overhead power lines, electrified roadways, power converters, charging infrastructure, vehicles equipped with pantographs or inductive charging systems, and control systems for managing power flow and vehicle communication.




2.1 ROAD SIDE UNIT



### 2.2 VEHICLE SIDE UNIT

• **Height sensor:** This sensor is used to detect height of vehicle & transfer the power through pantograph. The pantograph is a popular device for collecting power for overhead line.

• **LCD display:** It is used to display information.

• **Motor driver circuit:** It is used to drive DC Motor.

• **Motor:** There are 3 stepper motors are used 2 for vehicle for demo purpose and 1 for controlling or driving pantograph.

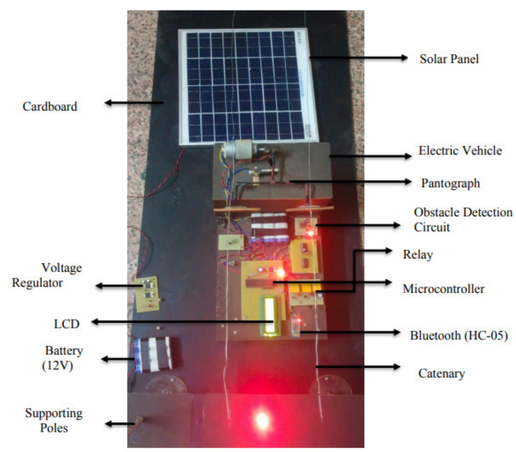
• **Battery charging circuit & battery:** Batteries store energy being produced by given generating source and when this source is unavailable this energy can be used by loads. The inclusion of storage in any energy generating system will increase the availability of the energy. • **Solar panel:** By using photovoltaic materials to convert the radiant energy directly into electrical.

• **Overhead lines:** It is also referred as ropeways which are used as a transmission line and pantograph is connected to it.

• **Microcontroller:** The microcontroller is the heart of the system. The AT89C2051 microcontroller is used for the system. It is 40 pin IC with 5 ports. The pantograph and height sensors are connected as its input and LCD display, motor driver circuit, motor, LED as an output.

## III.RESULTS:

The hardware module for an electric vehicle with Bluetooth control encompasses components like a motor controller, battery management system, and sensors. The motor controller manages power distribution to electric motors, while the battery management system oversees the battery's health. Sensors monitor parameters like speed and temperature. Bluetooth connectivity allows remote control and monitoring via a mobile app, enabling functions like locking/unlocking.



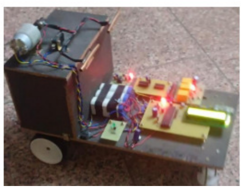

3.1 HARDWARE SETUP

**As an Electric Vehicle through (Conventional or Solar Source)** Electric supply in e-highways typically involves overhead lines or conductive rails embedded in the road surface to provide power to electric vehicles (EVs) while they are in motion. These systems transfer electricity from the grid or renewable sources to the vehicles through pantographs or other contact systems. The power infrastructure for e-highways needs to be designed to ensure safety, efficiency, and reliability, considering factors like weather conditions, traffic volume, and compatibility with different types of EVs. Additionally, integrating smart technologies can optimize energy usage and enable dynamic adjustments based on demand and other variables.

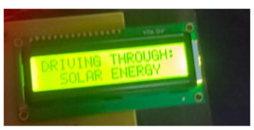
**Connecting the device Bluetooth** - controlled electric vehicle that moves particular direction is a electric vehicle programmed to respond to Bluetooth typed commands. Here the electrical device is connecting to the Android app. Bluetooth - controlled electric vehicle that moves forward direction is an electric vehicle programmed to respond to Bluetooth typed commands. These are the following instructions which process with the particular commands (f, b, r, l, s) and triggers the motor to move accordingly.


3.2 COMMOND WINDOW

**Movement of vehicle while connected to the conventional source** Electric vehicles equipped with pantographs engage with overhead catenary wires on e-highway lanes, drawing power for propulsion. They navigate while connected, ensuring safety and compliance with regulations. Upon exit, vehicles disconnect and may switch to onboard battery power. Monitoring systems oversee vehicle movement and infrastructure maintenance in e-highways, electric vehicles (EVs) move along designated lanes using overhead catenary systems or other electrified infrastructure. Here's a concise overview of their movement: Entry: EVs enter the e-highway lane equipped with overhead catenary wires or other power supply infrastructure. Power Connection: As the EV enters the electrified lane, its pantograph or similar mechanism engages with the overhead wires, establishing a connection to the power source. Propulsion: With the power supply established, the EV's electric motors receive electricity from the catenary system, enabling propulsion and movement along the e-highway. Controlled Travel: The EV's onboard control systems manage speed, acceleration, and navigation, ensuring safe and efficient travel along the designated lane. Continuous Power Supply: As the EV travels, it remains connected to the catenary system, continuously drawing power to sustain movement and operate onboard systems. Exit: Upon reaching the destination or exiting the e-highway, the EV's pantograph disengages from the overhead wires, transitioning back to other propulsion methods if necessary. Monitoring: Throughout the journey, monitoring systems oversee EV movement, ensuring compliance with safety regulations and optimizing infrastructure usage.




3.3 Movement of Electric Vehicle through Conventional Source




3.4 Vehicle Driving Through Solar Source

The car should be able to detect the obstacles for smooth and efficient working in order to avoid accident and collision. It should also be able to calculate the distance of the obstacle from the car. Similarly, Track Detection is also important as the autonomous car should stay within a predefined track and has to keep itself within the lines on both sides of the road. The detection of obstacle approximately a meter distance. A common configuration used in mobile vehicles or robots consists of two differentially driven wheels and castor (steerable front wheels or free running) wheels. DC motors or step motors can be used for driving the two controlled wheels. In our design we chose DC motors since they are easy to control and consume less energy from the battery. These are12V DC motors, used to drive the mechanism. The mechanism is quite simple, a wooden plank is used and it is considered as chassis or vehicle. Two DC motors are mounted below the chassis at rear side. Two plastic wheels with suitable bushes are coupled to the motor shafts. As described in the above sections, these motors are built-in with reduction gear mechanism, there by vehicle speed is minimized and load carrying capacity is increased. If both motors rotate in the same direction at equal speeds the vehicle will move forward or backwards based on the rotation of the wheel. If the speed of one motor is faster than the other, the vehicle will turn in the direction of the slower motor. If both motor rotates in opposite directions, the vehicle will spin in its place. This kind of two-wheel differential drive system needs one or more caster wheels (free wheels) to support the rest of the chassis while freely following the movement of the vehicle engaged by the two main drive wheels. In this particular project, one or two caster wheels are used for proper balance. To drive these two motors independently in both directions, drive sequence is programmed depending up on the information gathered from the Bluetooth module that is sent from the android device. To drive these two motors independently in both directions, four drive sequences are essential and this is achieved through 'H'-bridge IC. This IC is interfaced with controller and the supply to the motors is provided through this 'H' bridge IC. Depending up on the signals provided by a microcontroller.

| Commands | Vehicle Working State |
|---|---|
| F | Vehicle moves forward |
| B | Vehicle moves Backward |
| L | Vehicle moves Left |
| R | Vehicle moves Right |
| S | Vehicle comes to idle |
| 2 | Pantograph moves upwards |
| 3 | Pantograph moves Downwards |
| Z | Fast Speed |
| Y | Slow Speed |

RESULTS TABLE

**IV.CONCLUSION:** The paper work has been successfully produced and designed. A prototype module is built for demonstration purposes, and the outcomes are deemed acceptable. Given that it's a prototype module, a basic moving vehicle is built. This can be used on regular roads with an electric line in the future, in addition to highways. E-Highways, which electrify heavy-duty freight vehicles, present a viable approach to decarburze transportation. Electric trucks can be powered by conductive rails or overhead lines, which can drastically cut pollution and reliance on fossil fuels. However, thorough planning of the power infrastructure is necessary for successful adoption, taking into account aspects like safety, efficiency, and compatibility with various EV models. Smart technology integration can improve efficiency and performance even further. Governments and businesses working together to build out e-highway networks have the power to completely transform freight transportation, resulting in lower greenhouse gas emissions, cleaner air, and a more sustainable transportation future. This integration supports the overarching objectives of developing intelligent, energy-efficient transportation infrastructure, including vehicles that can move forward and backward in response to Bluetooth commands. It might make it easier to charge electric cars, cut greenhouse gas emissions, and help create more sustainable metropolitan areas. But in order for deployment to be successful, issues with affordability, robustness, upkeep, and general viability would need to be resolved. To fully utilize such integrated systems, further research and development in solar and transportation technologies are essential.

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