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E-Highway

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Abstract: *Highways are one of the significant parts of the modern world. They are important role in the progress of a country . The transport sector is heavily dependent on non-renewable energy sources. The transport sector not only contributes to the country's development, but also to the emission of greenhouse gases, which account for almost a fifth of the world's total energy consumption. The constant release of harmful gases from vehicles into the atmosphere must be curtailed and replaced with a more sustainable transport alternative. The viable alternative for this regular petroleum-based road transport is the introduction and use of e-highways with electric vehicles. The electric superhighway is a technology in which large trucks or hybrid vehicles with dynamic pantographs on the roof are connected or coupled to the trolley wires to draw electricity from the grid. As a result, e-highways with the combination of electric vehicles can eliminate the need for vehicle charging. This technology is the most efficient in terms of both fuel consumption and intelligent power supply*

Keywords: Dynamic pantographs, electric road systems, e-highways, electric vehicles, greenhouse gases, power grid, intelligent power supply, vehicle charging, etc.

I. INTRODUCTION

Motorways are an essential part of our society. They are vital to the quality of life and to the local and national economy. At the same time, by adopting the latest technological advances in computing and networking, highways are becoming a large systems system that is becoming orders of magnitude more complex to control and manage. Clearly, there is both demand and opportunity for new solutions that leverage available computing resources and whose design is inspired by computational thinking. In this project, we advocate an interdisciplinary approach to road traffic management that combines transportation, computational, and social perspectives.

Aim: Design and implement an e-highway system with more computing power, safety and lower costs.

II. METHODOLOGY

1. Planning and Route Selection: Identify the most appropriate EV route based on factors such as traffic volume, regional demand for EVs, proximity to population centres, and existing transportation infrastructure. The availability of power grid connections along the route should also be considered.
2. Infrastructure Development: Build the required physical infrastructure along the selected route. This includes the installation of charging stations or other charging infrastructure at regular intervals to allow users of electric vehicles convenient access to charging. The infrastructure can vary depending on the charging technology used, for example plug-in charging stations or wireless charging systems embedded in the road.
3. Power supply and distribution: Set up a reliable power supply and distribution system to meet the power needs of the charging infrastructure. This can include connecting to the existing power grid or considering alternative energy sources such as solar or wind power. The power supply should be sufficient to allow multiple vehicles to be charged at the same time along the electric highway.
4. Charging technologies: Determine the charging technologies to be used on the electric highway. Common options include Level 2 charging (AC charging) and Level 3 charging (DC fast charging). These technologies offer different charging speeds and may require different charging infrastructure. Fast charging stations are generally preferable for electric vehicles.

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2.1 Block Diagram

Roadside Unit :

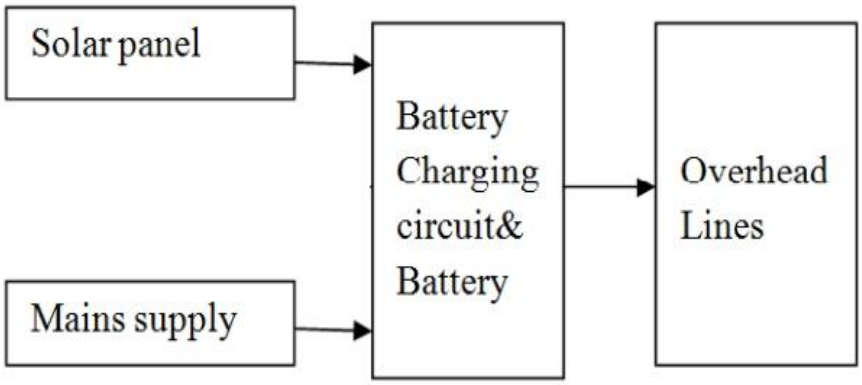

Fig 1: - Road Side Unit

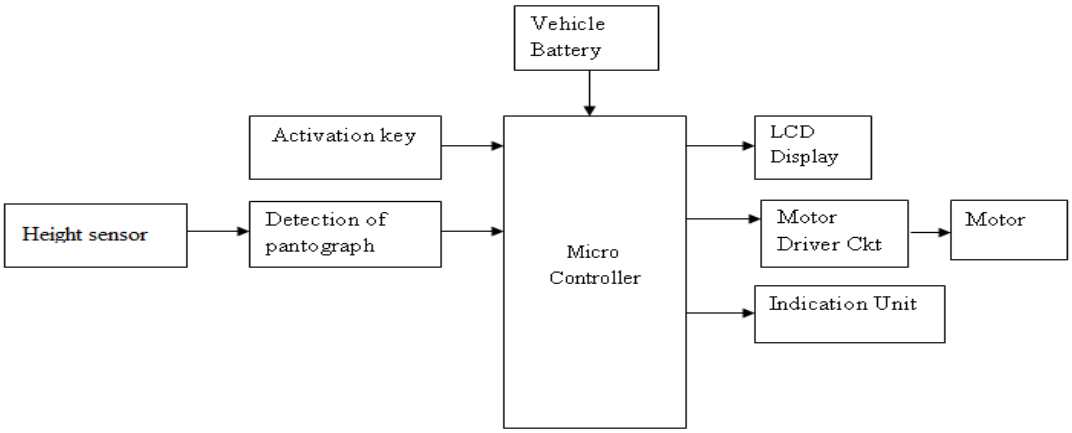

Fig 2: - Vehicle Side Unit

2.2 Block Diagram Description

- **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 is used as a transmission line and pantograph is connected to it.
- **Microcontroller:** The microcontroller is the heart of the system. The PIC16F877A 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.

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III. LITERATURE SURVEY

1. Infrastructure design: Infrastructure design should consider the arrangement and placement of overhead power lines, charging points and other necessary components. This may include coordinating with utilities, road authorities and other stakeholders to ensure proper installation and integration with existing infrastructure.
2. Compatibility and standardization: The development of compatible and standardized systems for overhead charging is crucial to enable interoperability between different vehicle manufacturers. This ensures that a wide range of electric vehicles can use the charging infrastructure without any compatibility problems.
3. Power supply and grid integration: Planning for sufficient power supply and grid integration is essential. This includes assessing the power requirements of the charging infrastructure and coordinating with the energy suppliers to ensure sufficient power supply capacity and grid stability.
4. Construction and Maintenance of Overhead Lines: The construction and maintenance of overhead lines requires expertise in electrical engineering and civil engineering. Considerations include the type of conductors, support structures, insulation, safety precautions and ongoing maintenance procedures to ensure reliable and safe operation.
5. Dynamic charging technology: Dynamic charging systems enable vehicles to be charged while driving by continuously drawing power from the overhead line. The implementation of this technology requires advanced control systems and real-time communication systems

IV. CONCLUSION

The deployment of electric highways has the potential to revolutionize the transportation industry by reducing carbon emissions and promoting sustainable transportation. By providing power to EVs while driving, this technology eliminates the need for large batteries and the associated range limitations. Your project likely focused on the feasibility, cost-effectiveness, and potential benefits of implementing electric road systems on highways. While the technology is still in the early stages of development, several pilot projects are already underway around the world, including in Sweden, Germany and the United States. The potential benefits of electric highways are significant, including reducing greenhouse gas emissions and improving air quality and reducing dependence on fossil fuels. Electric highways also have the potential to reduce transportation costs and increase the convenience of electric vehicles. However, there are also several challenges associated with this technology that need to be addressed. One of the biggest challenges is the cost of infrastructure development. Electric highway systems require the installation of overhead wires along highways, which can be costly. In addition, there is a need for standardized charging technologies to ensure compatibility between different electric vehicles and charging infrastructures. In summary, your project on electric highways has probably contributed to the growing body of research on the subject.

V. RESULT

Highway vehicle powering is an emerging technology that will power electric vehicles while driving. Theconcept behind this technology is to create a network of charging stations that are placed along highways and provide continuous power to electric vehicles while driving. One of the main advantages of having electricity on highways is that electric vehicles no longer have to stop and recharge their batteries, which can be time-consuming. Additionally, it may also help reduce range anxiety that often accompanies electric vehicles. However, there are several challenges associated with this technology, including the cost of infrastructure development and the need for standardized charging technologies. It is also important to consider the environmental impact of such infrastructure and the energy source used to generate electricity.

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