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On Road EV Charging system

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ABSTRACT: The restructuring of the Maharashtra State Electricity Board is changing the power scenario in the state. Within a span of one year, the restructuring has started yielding good results and there seems a great promise for the future of the power sector in the state. Proper restructuring of an electrical utility is possible only by proper analysis of the randomly varying parameters of the entire system. The analysis of these randomly varying parameters is done using various statistical methods. These statistical methods include probability distribution functions like Wei bull Distribution, Beta Distribution. For the purpose of proper planning and forecasting the average values of these parameters are calculated by the above said methods and are compared with arithmetic mean.

I. INTRODUCTION

This is a modern model of future transportation system. Highways are one of the significant parts of the modernized world. They play an important role for the development of country's economy. Every nation aims at a future which doesn't need nonrenewable sources of energy, but transport sector heavily depends upon non-renewable sources. The transportation sector contributes for the nation's development. The transport Sector massively depends on Non-Renewable Sources. Continuous release of harmful substances in the surrounding by the vehicle should be confined and restore with alternative transportation. Now world moving on from convention source of energy for powering transport, electricity the most popular choice for powering motors of propulsion in vehicles. As electric vehicle boosts the automobile sector but having some demerits like the Electrical heavy vehicle is not preferable for long distance travelling and it requires more charging time of the battery also more battery capacity is required [3,5,10]. So, the main aim of the paper proposal is to overcome these demerits. For that we are making the working model. The system is used in this model is similar to the system used in Electric train, i.e., catenary system (In that system the current is collected from the overhead transmission line with the help of pantograph and gives to the motor and vehicle will runs) [2]. Vehicles like trucks and hybrid trucks can instantly charge its battery using the power line [2]. The sensors inside the trucks takes for an electric contact line then truck automatically lift its pantograph and contact with electric line or else if there is no such sensor the driver manually set the position. The pantograph transfers this energy to electric motors as well as the charge the battery. When there is no power line, the truck can run on battery. Due to E-highway zero emission possible reduces CO2 emission [13]. Currently the E-highway are more flexible to truck transport as these are the major transports vehicle for goods and services [1,4]. Even the existing roads can be upgraded with E-highway structure because of this project crude oil imports can be reduced and save the cost of fuel [1,4]. Generally, power source integrated into the road surface by externally driving energy to an electric engine.

II. METHODOLOGY

In our project we have given 15V AC to overhead Transmission line which is taken through supply. When pantograph is connected to transmission line, current is transfer to the rectifier (to convert AC current to DC current) and then provide to motor of the Vehicle. Simultaneously current is also provided to battery for charging. It means at the same time vehicle is running on the supply as well as battery is charging [6]. We have used change over that is Switch for operational changes. Whenever the overhead supply is turned off, battery will be on and drive the vehicle without any delay in the motion of the vehicle . For the operation of vehicle, we have used Arduino uno which is control by software in the mobile.Vehicle wheels movements in either forward or reversed direction and it left or right directions are controlled through mobile app.

a) Supply of power and its distribution: Power supply and distribution a constant power supply is guaranteed by the substations along the E-Highway. For power distribution to the hybrid trucks, a specially designed two-pole contact-line system ensures a secure energy supply even at speeds reaching up to 90 km/h as shown in fig. 3



b) **Dynamic pantograph:** Active pantograph the key innovation of the E Highway system is the active pantograph. It can connect and disconnect the vehicle to the contact lines at all speeds. The pantograph transfers energy directly from the overhead contact line to the electric motor of the E-Highway adapted truck as shown in fig 3.3.



c) **Hybrid drive system:** Hybrid drive the E-Highway truck's hybrid drive system enables its full electrical operation within the electrification infrastructure. It also ensures flexibility by switching between electric and hybrid modes when overtaking, to bridge non electrified parts of the road, and to cover the first and last mile of each journey as shown in fig. 3.4



SYSTEM DESCRIPTION An Electric Road System (ERS) in which electrical energy is transferred during motion from the road to the electric vehicle for both propulsion and charging of battery which is a technology concept with great potential for reducing dependency on conventional sources and increased energy efficiency in the transport sector [1,9,12]. Generated Power supply is transmitted through high voltage transmission line. High voltage supply is step down to 15V by the transformer. Through substation, power is distributed to overhead Transmission line. Transmission line is connected to the pole which is mounted on the side of road. We have used the Catenary System technology on which Electric train runs; however, we have used Two Line AC System. Pantograph is mounted on the vehicle for the purpose of collecting large amount of current. When pantograph is connected to overhead transmission line, the current is transferred to the adaptor (Rectifier) through Pantograph. Further, Adaptor converts 15-volt AC to 15 volt – 2 A DC. Converted DC supply is given to the distribution Board. 12V Battery is connected to Distribution board and hence recharging and supply to the vehicle is provided through the same path. ESP8266 microcontroller is connected to distribution board. The ESP8266WIFI Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to Wi-Fi network. The ESP8266 is capable of either hosting an application or

offloading all Wi-Fi networking functions from another application processor. One ESP8266 is used for controlling the angle of servo motor shaft for desired operation. When motor angle is 0o , at that time pantograph is in downward position. Similarly, when motor angle is 90o , at that time pantograph is at its maximum height (i.e., connected to the overhead transmission line). The main processing unit consists of Arduino UNO to perform specified operations. Arduino UNO board is used as the main microprocessor of the device. It will run and will control the movement of the vehicle through the use of the motor driver who will control the wheels. The Programs are compiled using Arduino IDE and then the sketch is uploaded to the board using a pc and a USB cable. Speed variations can be achieved by making slight changes to the sketch. It is based on a 4-wheel drive platform integrated with an Bluetooth sensor to control the vehicle with the help of mobile software. fig. 3.5. In this technology we can used small capacity battery hence overall weight as well as initial cost of the vehicle is also reduced. It reduces the Static charging time of the electric vehicle and increase the range travelling distance of heavy vehicle. We have used Battery percentage indicator to indicate the amount of battery charged and voltage. When Pantograph is disconnected or any obstacles in overhead system does not affect the operation of the vehicle because change over takes place and battery will be ON state and further drive the Vehicle. The layout diagram of the working model is shown in fig.3.5.

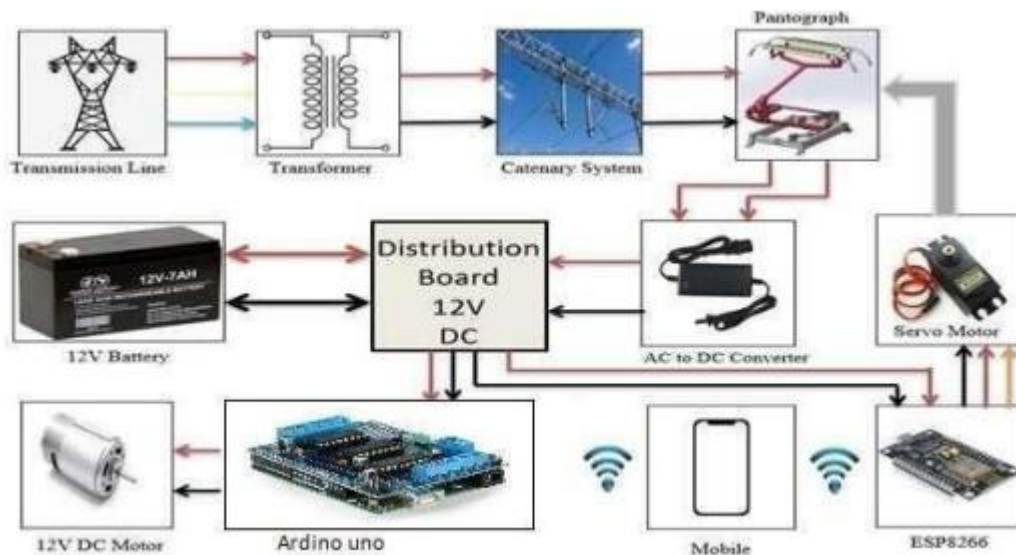


Fig 3.5: Layout diagram.

ELECTRIC ROAD SYSTEM ERS is a technology in which the electric power is transferred from the road to the electric vehicle while the vehicle is moving. The ERS consists of five main subsystems.

- Energy supply: is the power transmission process that delivers energy over long distances to the grid that will power the ERS substations.
- Road: involves the pavement, barriers for safety and noise protection, and other auxiliary components such as road signs.
- Power transfer: consists of three components: road power transfer (road equipment that detects the vehicle has attached to the system and initiates the power transfer), vehicle power transfer (controls the power safely received by the vehicle), and the control component (monitors the energy handover and system operation).
- Road operation: is the energy management of the overall system, handling and controlling access to the ERS lanes of the road based on vehicle identification (optional).
- Vehicle: converts the receiving power into the vehicle propulsion or stores the energy into the battery. It also provides user information, vehicle positioning, and supports fleet management

APPLICATIONS

Electrified mine transport application for the near and mid-term involves the connections between mines and storage or transit locations. This echoes the development of rail electrification, which began in mines before eventually spreading to broader and longer distance applications. An electrified mine transport is an economical solution allowing at the same time the minimization of harmful emissions and therefore a sustainable and clean operation as depict in fig.3.8.



Fig 3.9: Electrified Mine Transport.

Electrified long-haul transport with the design of its infrastructure and the innovative vehicle components, the E-Highway system can make a significant contribution in addressing the difficult challenge of economically decarbonizing long-haul transport as shown in fig. 3.9. In order to achieve the environmental goals and reduce CO₂ emissions, road freight transport requires a fundamental global shift from fossil fuels to alternative drive technologies. Siemens is a leading pioneer in this field, and is providing not only the technical solution for the electrification of freight transport but is also demonstrating a strategic approach achieving a large-scale implementation on highway systems where substantial cost savings





Electrified shuttle transport for the near and mid-term, the system will demonstrate its benefits in shuttle applications with a high volume of truck transportation as shown in fig.3.10. The E-Highway is an ideal solution for high frequency shuttle transport over short and medium distances like for example the connections of ports with



ARDUINO IDE: The Arduino Integrated Development Environment (IDE) is a cross- platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards.

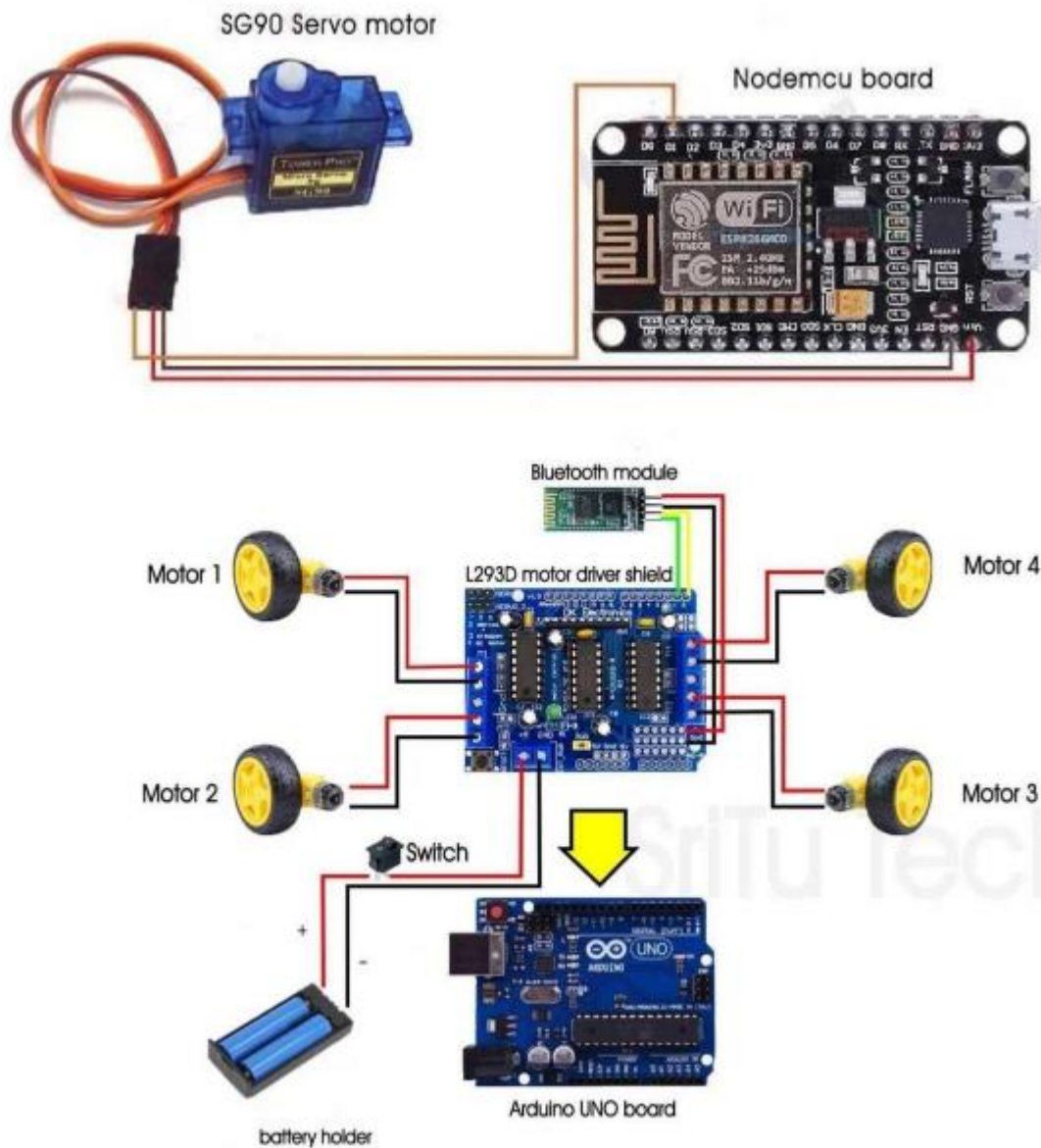


Fig 4.11: Arduino Integrated Development Environment

Blynk: A typical program used by beginners, akin to Hello, World! is "blink", which repeatedly blinks the on-board LED integrated into the Arduino board. This program uses the functions pin Mode(), digital Write() and delay() , which are provided by the internal libraries included in the IDE environment.



5.1.7 Connection diagram



IV. CONCLUSION

The project has shown that the E-Highway system can be implemented in an existing road infrastructure as a potential zero emission goods transport technology. Electric Highway framework not just works on the advantage of diminishing the unsafe Greenhouse gases outflows into the air yet in addition works on the country's economy by its real System. This cutting-edge energizing expressway is two times as rational as gas powered motors. Aside from this, it is a silent framework which turns out as an eco-accommodating strategy in transportation area. Contrast with that of Non-Renewable petrol-based transportation, running expense is less in E-Highway Catenary System that is power utilization is less. The world's first electrified road that recharges the batteries of cars and trucks driving on it has been opened in Sweden. Germany has presented the main electric expressway on its motorway framework to reenergize cross breed trucks as they drive. In Rail technology used in Germany, the path of vehicle cannot be changed while in catenary System we can change the lane in dynamic motion by taking pantograph downward. Also, the fault detection and fault recovery in catenary system is easy as compared to rail technology. During monsoon, the rail technology is less effective and not safe as water is clog on the surface of track.

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