Electric Vehicle Optimisation

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***Abstract*— To improve electric mileage of different Electric Vehicles (EVs), the power train design improvement is a must. And so it is essential to design and employ a optimize power train system for EVs. CVT is advisable , a s it maintains the operating condition of electric motor being closer to the most efficient region although vehicle speed is changing. Also the safety of the vehicle must be of utmost importance in situations such as theft and traffic accident problem Roads are broadly classified as flat, uphill, downhill road. The electric mileage optimization technique of vehicles, the motor of EV is switches off, once it detects the slope on the road is declined and at the same time alternator becomes turn ON which subsequently charge the battery. Hence but also battery gets recharge. Here is an attempt to design the power train using ADXL345 accelerometer. Also the module is integrated with GSM communication module and GPS chip which will help us during situations such as theft or accident.**

Keywords— Electric vehicle, Accelerometer, GPS.

I. INTRODUCTION

Coming with a better living standard, higher quality of traveling is demanded. In many developing countries, electric vehicles have been the priority for some groups to travel in the city, convenience and low price. Henceforth huge demands for Electric Vehicles (EVs), because it can reduce the fuel emission drastically which will change the environmental performance, like zero emission of carbon and diverseness of energy sources. Hence as compare to the Internal Combustion Engine (ICE) vehicles, the Mileage of Electric vehicle per charge are much shorter.

With the poor traffic condition and complicated society, the electric vehicle accidents and burglaries occur frequently. The safety of inhabitants and their properties should be of utmost importance.

Currently, most advanced electric vehicle terminals have adopted GPS technology on the guarding, with a single function and poor real-time monitoring performance. Even some terminals located by the base station are restricted by their position, which means they cannot be found if far from the base.

The electric vehicle monitoring system is based on the Internet of things technology.The real-time condition could be supervised well by the satellite positioning, data acquisition from the sensors, data transportation from GPRS and remote management of the PC or cell phone. It can be applied into the market for its strong terminal functions, low prices, low energy consumption, convenience on cell phone monitoring, short message alarming and good real-time property.

Vehicles is a Challenge which needs to be face. Electrification of the vehicle has been effective in different parameters such as carbon emissions, energy consumption, air pollution and oil dependence Electric Vehicles (EVs). [2] [3] since ages we have seen that the Electricity can be stored for long time in only one kind of Storage called as batteries.

These batteries are a group of connected cells which are again connected to each other in a configuration of series or parallel to achieve the desired amount of voltage, current and powerrequired to run the electric

motor(s) which, by the intermediate action of a motor driver, moves the vehicle and further gives supply energy to other vehicle's systems like Controller and Sensors etc. The average amount of power needed is some

850Watt to 1 kW [3]. The sensors modules are used to detect the physical quantities and convert into electrical values which will be forwarded to the Controller. The controller used in this project Arduino Uno R3. The sensor modules used are like accelometer, voltage sensor and some relay switches. The EV has a Hub Motor in the Front Wheel.

II. INTEGRATED DESIGN OF SYSTEM

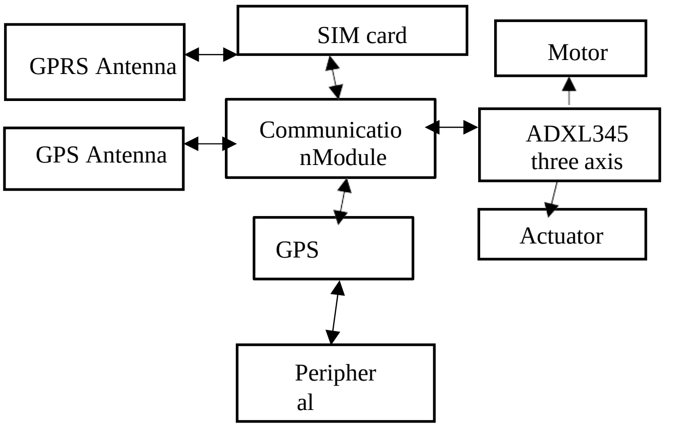

Fig. 1. Integrated design for electric vehicle

The GSM module and GPS chip positioner are primarily integrated into this module of terminal system. The data collected by GPS module could be acquired swiftly. Through IIC, the data collected by three-axis accelerate sensor are able to be read, as well as the interrupt data from Micro Control Unit. Every electronic embedded system requires some main objects such as sensors, controller actuators. The Sensors are used to the take the physical values and give It to the controller/ processor[4,5]. The Controller reads the value from the sensors and processes it in real time as per the program code. This program code can be as per the requirements of the user. The result is generated at the output to which the actuators are connected. The sensors modules are used to detect the physical quantities and convert into electrical values which will be forwarded to the Controller. The sensor modules used are like accelometer, voltage sensor and some relay switches.

A. SENSOR

ADXL345 three-axis acceleration sensor is adopted in the system. It is primarily used to monitor the real time conditions, such as the abnormal vibration of an unprotected electric vehicle and roll overs or crashes while driving. ADXL345 is a three-axis acceleration sensor which has small cubage, low power consumption and high resolution. The measurement range reaches ± 16g, which means it can be detected that not only the static acceleration of inclined state, but also the dynamic acceleration produced by crash of high-speed movement. Moreover, the change in the inclination of 1.0 degree is capable to be detected due to the 3.9mg/LSB resolution.

The connection between ADXL345 and IIC is shown in Fig.4. The address of IIC is 0x53 and the CS-pin should be pulled up to VDD I/O through a simple 2-wire connection, and ADD- pin must be connected to the VDD I/O or ground.

B. GSM Module

The SIM card mounted GSM modem upon receiving digit command by SMS from any cell phone sends that data to the MC through serial communication. While the program is executed, the GSM modem receives the command 'STOP' to develop an output at the MC, the contact point of which are used to disable the ignition switch.The command so sent by the user is based on an intimation received by him through the GSM modem 'ALERT' a programmed message only if the input is driven low.

III. EV POWER OPTIMISATION

In this part, we first describe the design of the experiment in which energy consumption and other data were collected. Then the methods used to analyse energy consumption are introduced. By using accelerometer sensor, we identify the characteristics of road surface and it is divided in to three part of stages as decline, inclined and normal surface. Hence first by using Arduino, with relay module we studied about rotation of motor such that when no slope, relay will be switched OFF and motor will stop otherwise motor will keep running. Due to increasing fuel electric charges it is imperative to have efficient EVs. In this project an attempt has been made to study the use of slope to improve the efficiency (mileage) of an Vs.

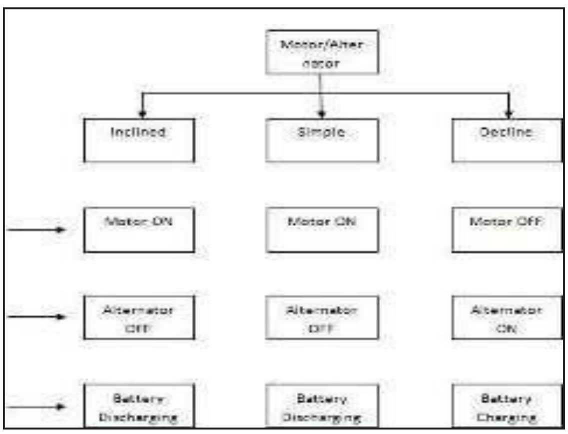

Fig. 2. Overview of output

A. Alarm Test

The simulation of crash alarming during the normal driving is carried out. A model is freely fell from a certain height to acquire an instantaneous acceleration at the moment it crashes to the ground. If this acceleration is bigger than the preset one, an alarm is occurred.

Modeling:

1) Rigid ground is used to restrict all the degrees of freedom in this model.

2) The normal velocity of electric vehicle is 30-45Km/h and 30 Km/h is used in the test. It equals to the crashing speed falling from 3.5m, approximately.

3) Considered that the parts of the electric vehicle would be squeezed with each other in a real crash, the model should be more similar to a multiple squeezing environment. The acceleration is progressively decreased. There is a certain relationship between the generated acceleration and the installation site of the terminal. Because of the unknown interaction during the crash, it is better to use the automatic single surface contact algorithm, which is the most common one in the car crash simulation tests.

4) According to the references, it takes less than 100ms to real crash, thus the data in this 100ms is mainly analyzed in this test.

B. Slope Test

1) When e-vehicle is simply running on road the motor turns ON and alternator as OFF.
2) When e-vehicle is running on inclined slope the motor remains turned ON and alternator as OFF.
3) When e-vehicle is running on declined sloped road the motor turns OFF and alternator as ON

Also, we are not using the dynamo for the purpose of charging of battery in all running conditions of e-vehicle. Under this condition wear & tear losses along with friction is being reduced and thus dynamo life is increased.

Power crisis has made expensive and unaffordable as well as use of Internal Combustion (IC) vehicles is polluting the environment. The world has realized the same promoting EVs today for EV adoption it is necessary to improve MPC (mileage per charge). Road surface having slope has got potential energy.

IV. CONCLUSION

Power train having accelerometer to identify potential energy and converting that to electrical energy will to improve MPC. The alternator system, motor, motor controller, DC-DC converter was considered in the work based on their extensive use in the field of automobiles. From the plotted graphs we can conclude that the vehicle travels for longer distance when the charging system has been adopted. The vehicle was tested for the source supply from the DC-DC converter to the batteries for many numbers of trials.

This depicted the successful results in extracting the rotational energy from the wheels through an alternator to charge the batteries arranged in series.The alternator used in the work will be in generating 12V – 14V using the rotational energy from the wheels under forward motion. The DC-DC converter steps up the source from 12V DC to 24V DC, which results in charging the batteries used for the work.

By utilizing PC or cell phone, the monitoring of thereal-time condition is more convenient and reliable. It has the advantages of small cubage, low power consumption, high efficiency and accuracy, owing to the integrated terminal modules and advanced GPS technology. Catered the demands of security and anti-theft properties, it has good prospects and promotion of value.

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