



MODIFICATION IN THE DESIGN OF ECU OF A MOTOR VEHICLE TO CONTROL THE SPEED DEPENDING ON THE DENSITY OF VEHICLE

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Abstract:

The need of a vehicle either a two wheeler or a four wheeler has become a necessity for almost all middle class and upper class people in these days. This leads to several problems in the city like traffic jam, accidents, air pollutions etc. Because of the density of vehicles in the city we find more and more accidents especially with the two wheelers, three wheelers and four wheelers. The main reason for the accidents in the city is the over speed without caring the movement of the other vehicles. The rider /driver is not bothered about the density of vehicles in the city. In this paper a suggestion is given to a special design for an Engine Control Unit (ECU) which will control the firing of engine based on the density of a vehicle in the city along with the accelerator given by the rider/driver. The paper suggests the government authorities to adopt a mobile SIM exclusively for each vehicle based on the vehicle registration number which should not be transferable. Using GPS techniques the entire information of the vehicle like speed in kmph, longitude, latitude, timing factor etc. should be monitored by the central server using the SIM and the server should send the maximum speed limit for that vehicle depending on the density of vehicles in the corresponding area. The ECU system should receive this maximum speed limit from the central server and the vehicle should not cross the limit even though the rider/driver raises the accelerator of the same. This technique will definitely reduce the accidents and gives a hassle free driving for all.

Index Terms: ECU, GPS, Mobile SIM & Modification in the Design of ECU

1. Introduction:

Transport or transportation is the movement or carrying of people and goods from one place to another place conveniently. Transportation improves the growth of respective industries and the demand of goods, creates place and time utility, which also requires quick marketing. There are mainly three modes of transportation as road transportation, water transportation and air transportation. The need of quick marketing and competitions with competitors some time leads to hazards or disaster or loss due to accidents. The road accidents are mainly due to over speed, negligence and not bothering the movement of other vehicles or co-riders. Proper and efficient monitoring of traffic density and speed helps to manage traffic flows and thereby to reduce the accidents [1-2].

Road safety is a national issue, considering its magnitude, explosive damage, negative impact on economy, public health and general welfare of the people and many more. Indian road witnesses at least one accident every minute and death in accidents every four and a half minutes (as per Indian government agencies survey). In this paper we give a suggestion to a special design for an Engine Control Unit (ECU) which will control the firing of engine based on the density of a vehicle in the city along with the accelerator given by the rider/driver. Engine Control unit normally controls some of the basic operations or tasks of engine. Global Positioning System (GPS) collects the entire information of the vehicle like speed in kmph, longitude, latitude, timing factor etc. This system works based on wireless mobile communication technique. The paper suggests the government authorities to adopt a mobile Subscriber Identification Module (SIM), which is unique and will contain entire information of the respective vehicle, exclusively

for each vehicle based on the vehicle registration number which should not be transferable. The central server sends the maximum speed limit for that vehicle depending on the density of vehicles in the corresponding area through GPS. The ECU system should receive this maximum speed limit from the central server and the vehicle should not cross the limit even though the rider/driver raises the accelerator of the same.

2. Related Research:

There are few papers which address road safety mechanism and new software based control system. The studies for hybrid electrical vehicle, has got more scope due to limited fuel based energy, global warming, exhaust emission limit, energy management strategies and electronic control units [3]. Vaughn, D. (1996) describes the GPS-map speed matching system for controlling and restricting the speed of the vehicle, to reduce the chance of accidents, which includes many components as GPS navigation receiver, a database processing facility, a GPS computer, an engine computer, a video display, a speed sensor and a heading sensor. This system compares the speed of the vehicle with maximum speed of the vehicle stored or posted in its database and signals the odometer to decrease the speed of the vehicle or automatically breaks the vehicle. The vehicle speed control system is a special software based control system which receives some information related to road such as road on which the vehicle travels radius of curvature and many more [4-5].

Khekare and Sakhare developed a new Vehicular Ad-Hoc Networks (VANET) which provides communication information between different units like vehicles themselves and between vehicles and infrastructure and they also introduced smart city framework which helps the driver to take correct traffic decisions through the help of information received from the system or framework [6-10]. This framework also consists of warning message module which helps the driver to know the present traffic conditions.

3. Objective and Methodology of the Study:

The main objective of this paper is to propose the innovative method through which the movement of all the vehicles is managed smoothly and continuously based on the density of the vehicle with the help of special mobile SIM and ECU unit. The sub objective is to avoid road accidents and safe driving/riding in the cities. We propose a conceptual methodology for this work. The various concepts involved in this work are

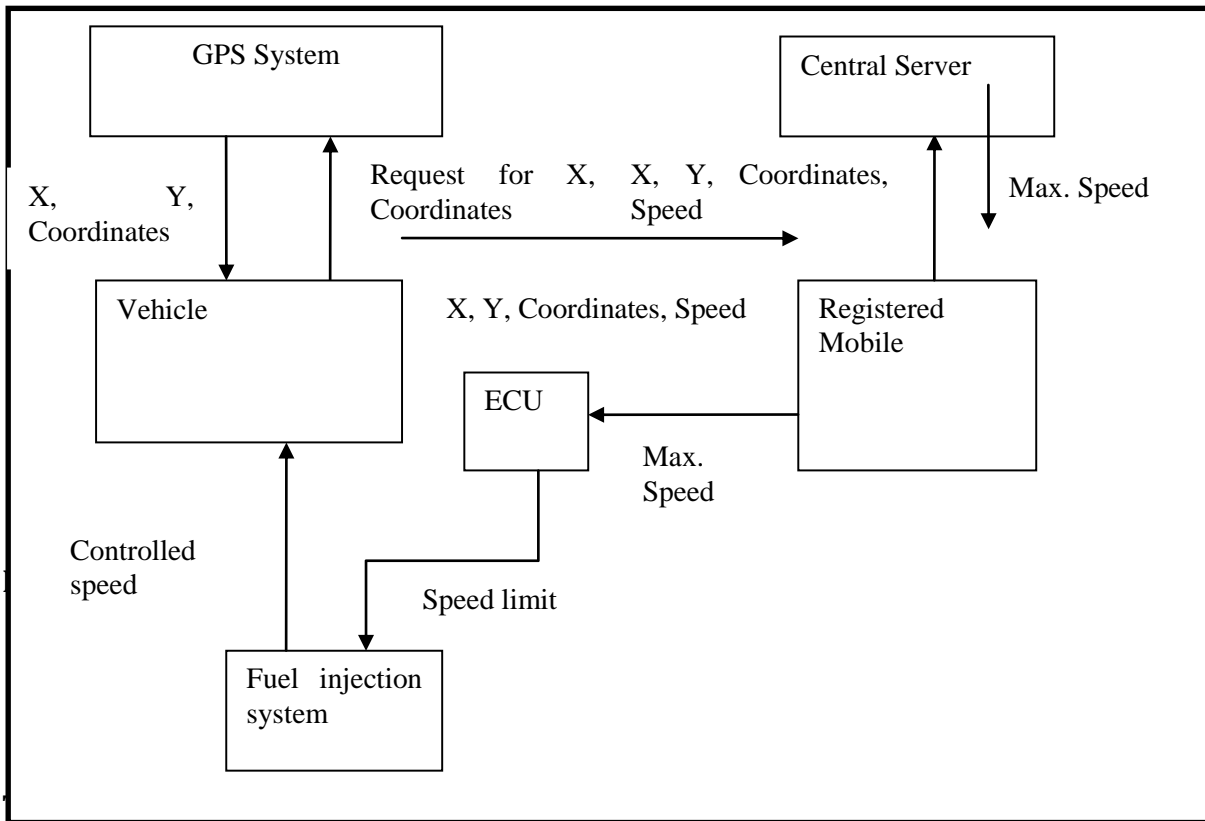
- Global Positioning System (GPS)
- Centralized server for determining the maximum speed for the particular coordinate
- Distance formula to determine the speed/ the density of vehicles
- Mobile Subscriber Identification Module (SIM)

4. The Proposed Model:

The proposed model is as shown in the figure 1. The vehicle can be either two wheeler, three wheeler or any other automobile vehicle which run using fuel on the road. Every vehicle during manufacture should have a Mobile SIM and GPS enabled system to track the vehicle while moving on the road. This SIM should be registered to the central server controlled by the government authorities (RTO) at the time of registration. The vehicle when it is moving on the road should give the following information to the central server through the registered mobile network with the help of a GPS system.

- The current position in the form of coordinates

- The speed at which the vehicle is moving on the road.



coordinates of the vehicle moving and the speed of the vehicle. From this information the server should find out the density of the vehicles at that place. Depending on the density the server should send the maximum speed limit to the vehicle moving. The maximum speed limit is a dynamic entity which keeps on changing depending on the density of the vehicle in the surrounding. If the density is less then maximum speed limit will be more where as if the density is more than the maximum speed limit will be less. In order provide this service the server needs the assistance of a Global Positioning System for tracking the vehicle and finding out the density and a registered mobile network for communication with the vehicle.

The movement of the vehicle is controlled by the ECU. The ECU should receive the maximum speed limit from the server through the mobile network and control the movement of the vehicle. The ECU should never allow the vehicle to go beyond the maximum speed limit even if the driver/ rider raises the accelerator. As shown in fig.1, first vehicle requests for x, y coordinates to know the global position of the same. The GPS also helps the centralised server to know the density of other vehicles. It returns the x, y coordinates to vehicle. This information is passed to central server through registered mobile along with request for maximum speed. Central server decides the maximum speed of vehicle depending on the density of the vehicles around the requested vehicle and returns back to ECU through registered mobile. ECU forwards this information to fuel injection system and this fuel injection system controls the ignition and thereby the maximum speed of the vehicle is under the control of the centralised server.

5. Analysis of the Model:

The Conceptual model of the Vehicle monitoring and speed limiting system is analyzed in terms of advantages, benefits, constraints and disadvantages.

5.1 Advantages:

This is a proposal for the new generation vehicles to avoid the accidents on the road. The movement of the vehicle will be very smooth avoiding accidents and traffic jam. The life of the vehicle be improved and this model drastically reduces pollutions by avoiding unnecessary burning of fuel by the engine. The fuel is burning inside the engine completely under the control of the ECU unit.

5.2 Benefits:

The vehicles having this model implimented will run on the road without any traffic blocks. The fuel efficiency will be increased. This model will be a life saving model.

5.3 Challenges:

Designing and implementation of this model needs to face a lot of challenges like

- Cost of designing for every vehicle.
- Technology change in implementing this model especially for two and three wheelers.
- Design and maintenance of centralised server.
- Govt. Statutory permissions.
- Customers or the users' acceptance.

5.4 Disadvantages:

Implementing this model for vehicles like Police vans, Police Bikes, Police Buses, and Ambulances etc may cause problems to the actual functionality. Two wheeler manufacturers may think that if this model is implemented then the company may loose the market.

6. Conclusion:

The proposed model will definitely reduce the accidents on the road especially inside the cities by limiting the speed. The observation says that most of the road accidents inside the city are because of reckless speedy driving which can be completely prevented by the ECU. Implementing this model for two wheelers reduces accidents drastically because the observation says that most of the two wheeler accidents are due to over speed and rash riding by the college students. The paper suggests the government authorities to adopt a mobile Subscriber Identification Module (SIM), which is unique and will contain entire information of the respective vehicle, exclusively for each vehicle based on the vehicle registration number which should not be transferable. Implementing ECU controlled by the central server will never allow the rider to ride the two wheeler fast inside the city. But design and implementation of this model is very difficult because of the acceptance level of the customers.

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