

MONITORING DRIVING BEHAVIOUR OF MOTOR VEHICLE WITH MOBILE APPLICATION

Authors

**S. Sasi kumar¹, N. Bharathiraja^{2*}, S. Sellakumar³, V. Yeswanth Rohith⁴,
M. Vaishali⁵, N. Srimathi⁶**

^{1,2,3}Assistant Professors / CSE, Saveetha Engineering College, Anna University Chennai.

^{3,4,5}UG Students / CSE, Saveetha Engineering college, Anna University Chennai

*rajamesoft@gmail.com

ABSTRACT

Real-time abnormal driving behaviors monitoring is a cornerstone to improving driving safety. The usage of vehicles is increasing day by day. This paper presents the driving style architecture which uses data mining techniques to analyze the driving patterns of individual especially the degree of aggressiveness of each driver. Many Intelligent Transportation Systems (ITS) rely on connected vehicle applications to solve the real-world problems. To improve awareness among the drivers and their driving habits to prevent potential car accidents, a driving approach needed to be considered, which not only detects abnormal driving behaviors but also identifies specific types of abnormal driving behaviors. When coupled with the eco-driving the system has gained great significance in recent years. The prototype of an onboard unit defines driving techniques save fuel consumption regardless of the technology used inside the vehicle. Overall, our platform is able to assist drivers in correcting their bad driving habits, like rash driving and violating speed limits and offers helpful tips to improve fuel economy and driving safety.

Keywords: Abnormal driving behavior - Accelerometer – Fuel consumption detection - Orientation sensor - Neuron Networks (NN) - Gravity Sensor - Android-based smart phone with GPS.

1. INTRODUCTION

This paper is about to provide the convenience of driving vehicle in day to day life. It also represents the different driving styles in adopting data mining techniques and analysis neural network. [10] Driving style classification and fuel consumption in variety of driver characterization can be obtained. There are many types of vehicles and different types of driving styles adopted by many drivers. Developing technology in which vehicles runs under various circumstances are verified. It is very difficult to travel in road in now a days and it is very dangerous. Paper have different driving styles like driving like driving fast, not obeying the rules and crossing speed limits. Many accidents are happening because of these problems. To maintain a constant checking and monitoring of driver behavior smart phone sensors are used. In this paper, demonstration of different driving styles for consuming fuel and correlate each vehicle with greenhouse gas emission was generated.

[5] This platform will assist driving style habits, which offers helpful tips to improve safety for drivers and improving fuel economy. Additional features such as building a local ad-hoc network to exchange the information faster in emergency situation to help. Transmitting maintenance and logistic information to reduce time and save money are

implemented in buses, trucks and train. All necessary steps for any type of accidents can be prepared for diagnosis. Improve business productivity by streamlining interaction and taking advantage of immediate access. Reduce business operations costs by increasing supply chain visibility, optimizing logistics and accelerating processes. Strengthen customer relationships by creating more opportunities to connect, providing information at their fingertips when they need it most. Gain competitive advantage by creating brand differentiation and expanding customer experience. Increase work force effectiveness and capability by providing on-the-go access. Improve business cycle processes by redesigning work flow to utilize mobile devices that interface with legacy applications.

2. LITERATURE SURVEY

The driving styles architecture integrates both data mining techniques and neural networks to generate a classification of driving styles by analyzing the driver behavior along each route. [11] In particular, based on parameters such as speed, acceleration, and revolutions per minute of the engine (rpm), thus a neural network is implemented based algorithm that is able to characterize the type of road on which the vehicle is moving, as well as the degree of aggressiveness of each driver. The final goal is to assist drivers at correcting the bad habits in their driving behavior, while offering helpful tips to improve fuel economy. In this work the system takes advantage of two key-points, the evolution of mobile terminals and the availability of a standard interface to access car data. This driving styles platform to achieve a symbiosis between smart phones and vehicles able to make the former operate as an onboard unit. [15] Results show that neural networks were able to achieve a high degree of exactitude at classifying both road and driver types based on user traces. Driving styles is currently available on the Google Play Store platform for free download, and has achieved more than 1550 downloads from different countries in just a few months.

Despite the recent technological improvements in vehicles and engines, and the introduction of better fuels, road transportation is still responsible for air pollution in urban areas due to the increasing number of circulating vehicles, and their relative travelled distances. We develop a methodology to calculate, in real-time, the consumption and environmental impact of spark ignition and diesel vehicles from a set of variables such as Engine Fuel Rate, Speed, Mass Air Flow, Absolute Load, and Manifold Absolute Pressure, all of them obtained from the vehicle's Electronic Control Unit (ECU). Our platform is able to assist drivers in correcting their bad driving habits, while offering helpful recommendations to improve fuel economy. [6] This system will demonstrate through data mining, to what extent the driving style really affects (negatively or positively) the fuel consumption, as well as the increase or reduction of greenhouse gas emissions generated by vehicles.

Hybrid Electric Vehicles (HEVs) are increasingly gaining popularity due to their lower fuel consumption. Current hybrid vehicles mostly use their battery or the Energy Storage System (ESS) as a secondary source of power. If the ESS were to be used as a primary source of power, then the ESS size would be one of the important features in the design of an HEV. In addition, HEVs have to employ an intelligent energy management strategy to provide the best fuel economy in all driving situations. [12] This article presents an investigation on the effect of the variation of the ESS size on the fuel economy of an HEV and the important design criteria involved in the design of the ESS. Simulations carried out using Advanced Vehicle Simulator (ADVISOR) software show that fuel economy is not linearly related to ESS size and therefore the ESS needs to be designed based on the average daily driving distance and the driver behavior.

3. RELATED WORK

There are related works that are implemented in driving behavior styles. Many related works are developed in creating a user interfaces with the universe which includes some research in mobile devices. It provides reuse of mobile platforms in enabling the software depending on the construction of self-adaptive devices. Figure.4 gets the destination location from the user to track their driving information. Software Products provides lines for mobile application in the functionality across many platforms. These requirements are proposed to adopt satisfaction in different environment.

When coupled with the eco-driving concept, it has gained great significance in recent years. An example is the prototype of an onboard unit developed by Hernandez et al.. These driving techniques save fuel consumption, regardless of the technology used inside the vehicle. One of the main problems of eco-driving systems is identifying the factors that affect energy consumption. Ericsson suggests that, in order to save fuel, sudden changes in acceleration and high speed driving should be avoided. Johansson et al. suggest maintaining low levels of deceleration, minimizing the use of the first and second gears, and putting every effort into using the 5th and 6th gears, while avoiding continuous gear changes.

Our proposed architecture applies data mining techniques to generate a classification of the driving styles of users based on the analysis of their mobility traces. [7] Such classification is generated taking into consideration the characteristics of each route, such as whether it is urban, suburban, or a highway, and it is then correlated with the fuel consumption and emissions of each driver. An application for Android based smart phones.

A data center offering a web interface to collect large data sets sent by different users concurrently and to graphically display a summary of the most relevant results, like driving styles and route characterization of each route sent.[4] Our solution is based on open source software tools such as Apache, PHP. Correctly identify, for each path segment, the driving style of the driver, as well as the segment profile: Urban, suburban or highway. The goal is to dynamically and automatically analyze user data, reporting to the drivers in real time and allowing them to find out their driver profile, thus promoting a less aggressive and more ecological driving. Our platform helps to promote a more ecological driving style by emphasizing on the relationship between driving style and fuel consumption, which has a clear and direct impact on the environment. It has been also demonstrated that the driving style is directly related to fuel consumption. For example rash driving will have a direct influence to the RPM of the vehicle. [8] Thus when the RPM increases and decreases rapidly it affects the engine life and the smoke emission. Fuel is not completely burned thus leaves a lot of fuel that is not burned fuel residue which is emitted by the vehicle as smoke. Thus to reduce the smoke emission rapid accelerations and decelerations should be avoided.

4. PROPOSED SYSTEM ARCHITECTURE

The input design is the connection between information system and the user. It comprises the developing specification and strategies for data preparation and those steps are necessary to put transaction data and utilize form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people making the data directly into the system. The input design focuses on controlling the amount of input required, controlling driving styles, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that, it provides security and flexible in use with retaining the privacy. It is important to design and to avoid errors in data input process and show the correct direction to the management for getting correct information from the system.

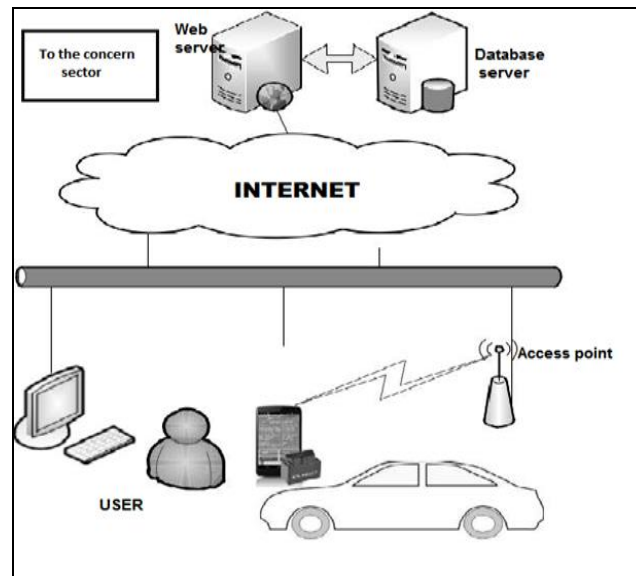


Figure.1 Proposed System for Driving Control for Motor Vehicle

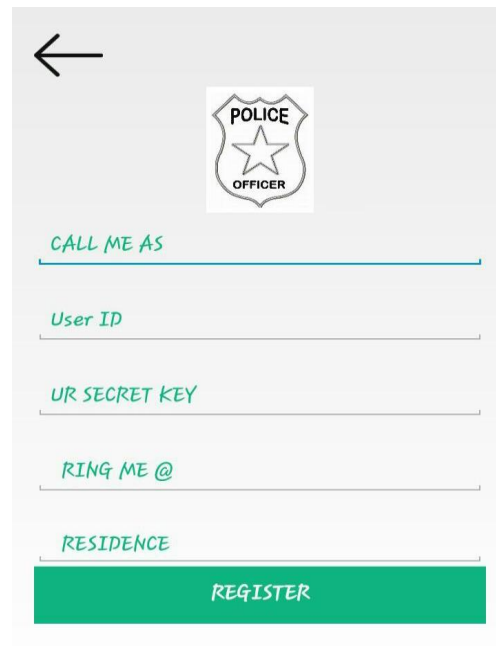
The data that is obtained from the smart phone is sent to the server where it is processed. Based on the movement of the vehicle the system identifies the change in position of the vehicle and the time taken. It calculates the speed of the vehicle and its acceleration based on which the CO₂ emission can be determined.

5. IMPLEMENTATION AND RESULTS

This implementation allows the user to view distance in map between source and destination. Track a GPS enabled cell phone on Google maps. Project includes cell phone source and source code to display data on your own website. Currently, the GPS will only be useful to you to carry along to find out the latitude and longitude. The Web-based interactive digital maps use this technology, which also powers the 'Windows Live Local mapping service,' so users do not need to download and install any software to use the maps. A data center offering a web interface to collect large data sets sent by different users concurrently and to graphically display a summary of the most relevant results, like driving styles and route characterization of each route sent. [1] To achieve this, it is based on the Open Systems Interconnection (OSI) Basic Reference Model (BRM) in accordance with [ISO 7498](#) which structures communication systems. [4] Based on the movement of the vehicle the system identifies the change in position of the vehicle and the time taken. It calculates the speed of the vehicle and its acceleration based on which the CO₂ emission can be determined. The solution is based on open source software tools such as Eclipse and PHP

[3] Fuel consumption is usually represented as the ratio of fuel consumed per distance travelled, being measured in terms of liters. In this work, the focus is on gasoline and diesel engines. Figure.1 shows the login for the new user. In order to achieve this objective, the system relies on the collaboration of drivers from around the world using our platform. [13] In this particular study, the behavior of routes using the neural network is analyzed. Figure.2 allows the user to make registration by entering the username and secret key. For each section, the neural network returns the corresponding driver behavior, and combine this data with the fuel consumption data corresponding to that route. [14] The smoke emission being dependent on the fuel consumption can also be determined. Petrol and diesel engines emit smoke in different proportions to the fuel consumed. The life of an engine is also dependent

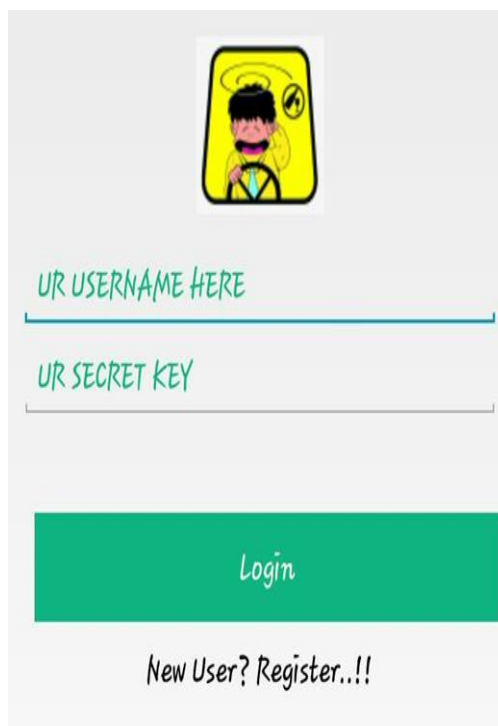
on its smoke emission.



The registration page features a light gray background. At the top left is a black back arrow. In the center is a police officer badge icon with the words "POLICE" and "OFFICER". Below the icon are five text input fields with green placeholder text: "CALL ME AS", "User ID", "UR SECRET KEY", "RING ME @", and "RESIDENCE". At the bottom is a green button with the text "REGISTER" in white.

Figure .2 Registration page to make initial processing

After installed the android application in the mobile device the user is to register and login. After the login process user details will be processed to data server.



The login page features a light gray background. At the top center is a cartoon character icon with a yellow background, wearing a blue shirt and a yellow halo. Below the icon are two text input fields with green placeholder text: "UR USERNAME HERE" and "UR SECRET KEY". At the bottom is a green button with the text "Login" in white. Below the button is the text "New User? Register..!!" in black.

Figure .3 New login for the users to register first time

The server receives data sent from the Android ap-plication of each user, and it provides functionality to work with User, Routes, and Statistics. The most relevant items are sex, age, and other details concerning the vehicle used: car manufacturer, model, fuel type, and the theoretical 0–100 acceleration level (important to normalize the user behavior in the study).

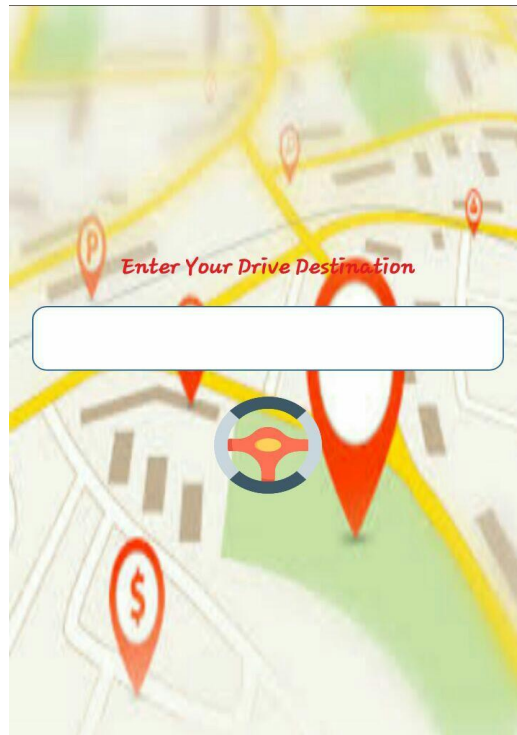


Figure.4 User should select the destination location to track their driving styles

In this module, the user destination is entered, where the user can view distance in map between source and destination. Track a GPS enabled cell phone on Google maps. Project includes cell phone source and source code to display data in the website. The Web-based interactive digital maps use this technology, which also powers the 'Windows Live Local mapping service,' so users do not need to download and install any software to use the maps. [9] The knowledge obtained with different traces analyzed, along with the drivers using the application, the system shows a correct classification of the different routes registered, both in terms of route types and driving styles, thus validating the proposed solution.

Installation of this mobile application gets the full details about the driver and the vehicle while helps to predict the driving styles. Figure.6 represents the complete detail about the usage of mileage and smoke emission. Thus improving mileage thus reducing the smoke emission with this knowledge the different traces of routes along with the drivers using this Android application can help to validate the behavioral styles.



Figure .5 Driving location and timing is obtained and shown for user

Traffic	Moderate
Speed	13 km/hr
Date	20-03-2018
Ending Time	20:13:06
Total Time	0:06:373
Fuel Economy	18 l/100km
Average Speed	14km/hr
Maximum Speed	73km/hr
Mileage	14km
Samples	300
Co2 Emission	18 kg/100km
Send	Performance
Car Sensors	Maps

Figure .6 Driving Styles And Road Information Is Gathered For Final Processing

6. CONCLUSION AND FUTURE WORK

This paper presents our driving styles platform, which integrates mobile devices with data obtained from the vehicle's engine ECU to characterize driver habits, as well as the associated fuel consumption and emissions. [2] The platform helps to promote a more ecological driving style by emphasizing on the relationship between driving style and fuel consumption, which has a clear and direct impact on the environment. It has been also demonstrated that the driving style is directly related to fuel consumption. Specifically, adopting an efficient driving style allows achieving fuel savings ranging from 15 to 20%. [8] An aggressive driving style always results in greater energy consumption and more CO₂ emissions, whereas smooth driving ends up providing greater energy efficiency and reduced gas emissions. This application will be available for free download in the driving style's website and Google play store. This emphasizes the great interest about research on this topic. As future work, this platform can be extended by providing route recommendations based on real-time feedback about the congestion state of different alternative routes, as well as providing estimated greenhouse emissions for different routes.

REFERENCES

- [1] 8International Organization for Standardization, Road vehicles, Diagnostic systems, Keyword Protocol 2000, 1999.
- [2] J. E. Meseguer, C. T. Calafate, J. C. Cano, and P. Manzoni "driving styles :a smartphone application to assess driver behavior," in Proc ISCC, 2013.
- [3] J. E. Meseguer, C. T. Calafate, J. C. Cano, and P. Manzoni "Assessingthe impact of driving behavior on instantaneous fuel consumption," inProc.CCNC, 2015
- [4] A.Meintz, and M. Ferdowsi "Designing efficient hybrid electric vehicles,"IEEE Veh. Technol. Mag., vol. 4, no. 2, June 2009.
- [5] U. Hernandez, A. Perallos, N. Sainz, and I. Angulo "Vehicle on board platform: Communications test and prototyping," in Proc. IV, 2010, pp. 967–972.
- [6] E. Eriksson "Independent driving pattern factors and their influence on fuel-use and exhaust emission factors," Transportation Research Part D:Transport and Environment, vol. 6, no. 5, pp. 325–345, 2001.
- [7] H. Johansson, P. Gustafsson, M. Henke, and M. Rosengren "Impact of Eco Driving on emissions," in Proc. TAP, Avignon, France, 2003.
- [8] M. Kuhler, and D. Kartens "Improved driving cycle for testing automotive exhaust emissions," SAE Technical Paper Series 780650. 1978.
- [9] M. Andre "Driving cycles development: Characterization of the methods, "SAE Technical Papers Series 961112, 1996 .
- [10] D. Y. C. Leung, D. J. Williams, "Modelling of Motor Vehicle Fuel Consumptionand Emissions Using a Power-Based Model," Environmental Monitoring and Assessment, vol. 65, pp. 21–29, 2000.
- [11] COPERT III, "Computer programme to calculate emissions from road transport Methodology and emission factors," (Version 2.1), Technical report No 49.
- [12] S. Matsumoto and H. Kawashima, "Fundamental study on effect of preceding vehicle information on fuel consumption reduction of a vehicle group," J. Common. Network., vol. 15, pp. 173–178, 2013.
- [13] R. Hecht-Nielsen "Theory of the back propagation neural network – neural networks," in Proc. IJCNN, 1989.
- [14] "VR-Based Fuel Consumption Gauge," Circuit Cellar Mag., vol. 183,pp. 59–67, Oct. 2005.
- [15] S. Haykin "Neural networks: A comprehensive foundation," NY: Macmillan,p. 2, 1994.

