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ANDROID BASED EFFICIENT ROAD SAFETY MEASURES AND DRIVER BEHAVIOUR MONITORING SYSTEM

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ABSTRACT - The main objective of this application is to enhance the user safety, by analyzing the road conditions and user behavior by using sensors associated with android mobile. This system enhances the user safety measures by identifying the user behavior such as follows: (i) the user wearing helmet or not (ii) Monitor the driving condition by using accelerometer connected in mobile phone and (iii) Locating the user position by means of mobile GPS. This system allows further precedence only if the user is wearing helmet or else it produces the alert message like the user is not wearing helmet to administrator. In the proposed approach, once the user entered successfully into the application, it shows the user's vehicle position and in which direction the user is proceeding on. As well as, this application is used to track the location of the user (vehicle) by using mobile Global Positioning System (GPS). For all the entire system is used to improve the safety measures of user and feels them more secure in roads while driving.

Index Terms – Proximity Sensor, Accelerometer, GPS, Android, Decision-Tree Algorithm, C-Series Machine Learning Algorithm.

I. INTRODUCTION

Intelligent transportation systems (ITS) introduce advanced applications aimed at providing innovative services, offering traffic management and enabling users to be better informed, including support for safety, mobility, and environmental applications. In parallel to ITS, mobile devices have experienced technological breakthroughs in recent years, evolving towards high performance terminals with multi-core microprocessors. The smartphone is a clear representative outcome of this trend. In addition, the on-board diagnostics (OBD-II) standard, available since 1994, has recently become an enabling technology for in-vehicle applications due to the availability of Bluetooth OBD-II connectors. These connectors enable a transparent connectivity between the mobile device and the vehicle's electronic control unit (ECU). When combining high performance smartphones with OBDII connectivity, new and exciting research challenges emerge, promoting the symbiosis between vehicles and mobile devices, and thereby achieving novel intelligent systems. Driving Styles implements a solution based on neural networks, which is capable of characterizing the driving style of each user, as well as the fuel consumption. In order to achieve this functionality, the data is obtained from the ECU via the OBD-II Bluetooth interface, including the speed, acceleration, revolutions per minute of the engine, mass flow sensor (MAF), manifold absolute pressure (MAP), and intake air temperature (AIT). Currently, this information can be collected and used in applications aimed at improving road safety and promoting eco-driving, thus reducing fuel consumption and greenhouse gas emissions.

A. RELATED RESEARCH SUMMARY

Technological advancements in the field of mobile telephony are making smartphones very powerful. This high computing power opens new and attractive opportunities for research. 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.

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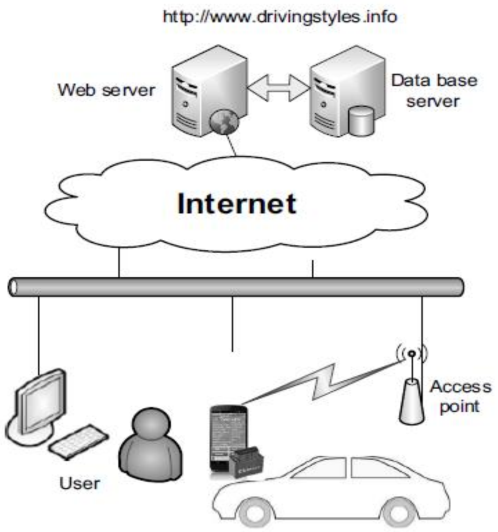

Fig.1 Overview of the Architecture

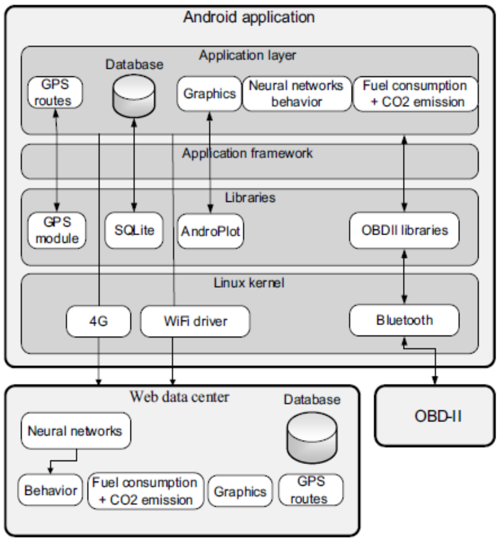

Fig.2 Block Diagram of the Architecture

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.

B. SYSTEM REPLICATION

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. 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.

To achieve the overall objective, our system comprises four elements:

(a) An application for Android, based smartphones. Using an OBD-II Bluetooth interface, the application collects control information (by default every second, but it is configurable by the user such as speed, acceleration, engine revolutions per minute, throttle position, and the vehicle's geographic position. In addition, we also obtain via OBD-II the mass flow sensor (MAF), the manifold absolute pressure (MAP), and the intake air temperature (AIT) that are used in the calculation of fuel consumption. After gathering the information, the user can upload the collected data to the remote data center for analysis.

(b) 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. Our solution is based on open source software tools such as Apache, PHP and Joomla.

(c) A neural network, which has been trained using the most representative route traces in order to correctly identify, for each path segment, the driving style of the driver, as well as the segment profile: Urban, suburban or highway. We use the backpropagation algorithm, which has proven to provide good results in classification problems such as the one associated to this project.

(d) Integration of the tuned neural networks both within the mobile device itself, and in the data-center platform. The goal is to use neural networks to dynamically and automatically.

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II. RELATED STUDY

Meseguer et al, [1] proposed a paper related to A Smartphone application to assess Driver Behavior in Android. In this paper, The DrivingStyles architecture integrates both data mining techniques and neural networks to generate a classification of driving styles by analyzing the driver behavior along each route.In particular, based on parameters such as speed, acceleration, and revolutions per minute of the engine (rpm), we have implemented a neural network-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 we take advantage of two key-points: the evolution of mobile terminals and the availability of a standard interface to access car data. Our DrivingStyles platform to achieve a symbiosis between smartphones and vehicles able to make the former operate as an onboard unit. 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. DrivingStyles 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.Matsumoto et al, [2] proposed a paper related to Fundamental study on effect of Preceding Vehicle information on Fuel Consumption Reduction of a Vehicle group in Android. In this paper, It is a concern that eco-driving vehicles, because their driving behavior differs from other vehicles due to e.g. e-start, may inhibit smooth traffic flow. Therefore, it is necessary to study the cooperative eco-driving done by a vehicle group, putting “vehicle-to-vehicle communication” and “road-to-vehicle communication” into perspective. Based on these factors, this study aimed to: 1) Analyze fuel consumption rates and driving behaviors of more than one vehicle following an Eco-Driving vehicle. 2) Examine the effect of information on the fuel consumption rate of the preceding vehicles on the following vehicles. As a result, the following findings were obtained: 1) By providing information to multiple following vehicles, the fuel consumption rate of the second vehicle was not lowered, while that of the third one was. 2) It is possible that, when information on fuel consumption of a preceding vehicle is provided to the following one, an inter-vehicular distance is shortened during deceleration to contribute to smooth traffic flow. From the above results, it is suggested that, when targeting a vehicle group, sharing the information on preceding vehicles is effective.

III. PROPOSED WORK

In the proposed approach of smart road safety measures lots of useful features are provided to user’s to avoid road accidents and provides a safe riding on roads. Initially it asks the user to register their details into server. In the proposed approach, the system Safety Checking process means wearing the helmet or not, which is done by using Proximity sensor. Once the Helmet is weared properly, then only the application allows the user to proceed further. This application provides provision to identify the user’s Vehicle Location instantly as well as summarize the Vehicle Movement Status to alert and avoid road Accidents. Decision Tree Algorithm and C–Series Machine Learning Algorithm are used in an application.

This proposed approach contains several advantages, in which those are listed as below:

- ✓ Road Accidents are highly avoided.
- ✓ Location is properly detected using mobile GPS.
- ✓ Analyzing the speed level and position with proper norms.
- ✓ Accurate and proper outcomes are grasped by means of GPS and Proximity sensor.

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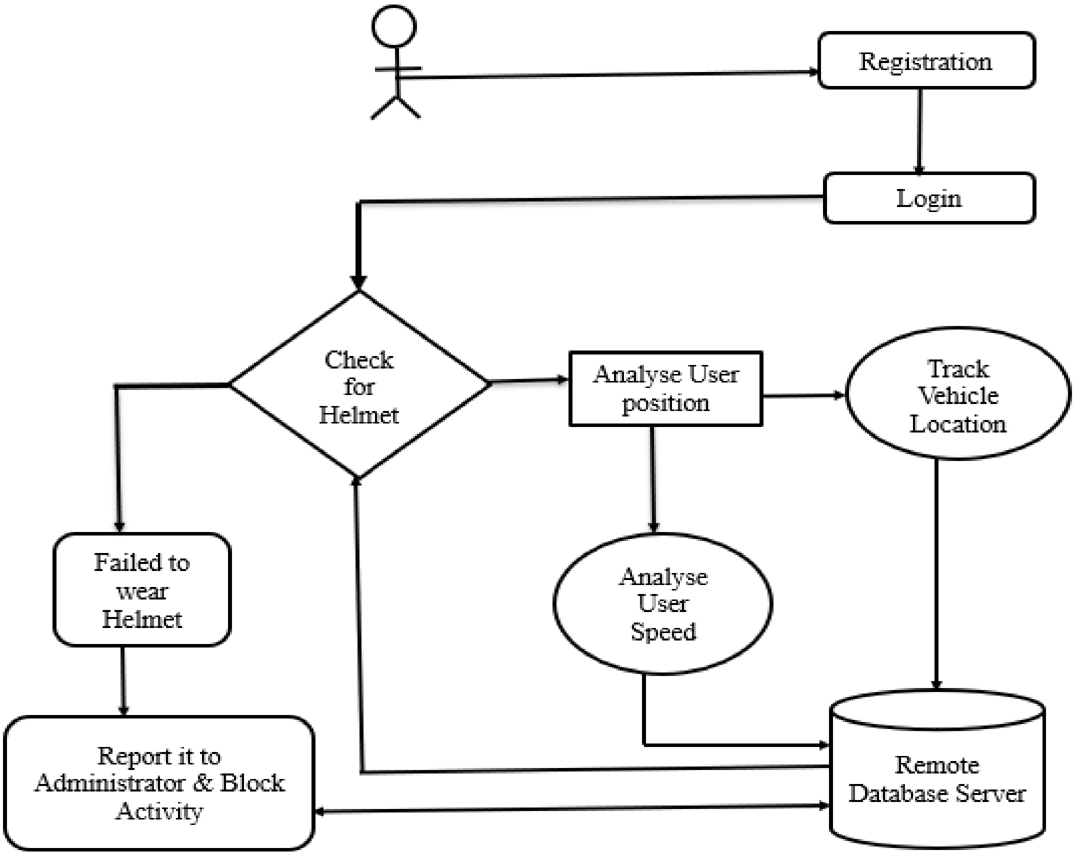

Fig.3 Proposed System Architecture

A. USER REGISTRATION PROCESS

The user details registration module allows the new users to register his/her details into our android application, which has lots of identity attributes such as Driver Name, Mobile Number, Address, Emergency Number and so on. This is an entry point to all users to register the identity and which it leads to login into the application.

B. CHECKING FOR SAFETY

The safety checking module is an important feature of the application, which is triggered out by the proximity sensor presented into the android mobile. The application triggers the mobile application to use the proximity sensor to verify the user is wearing the helmet or not.

C. LOCATION TRACKING

The vehicle location tracking module is efficiently triggered by means of mobile GPS and which returns the longitude and latitude details of the driver to identify the location of the respective user.

D. VEHICLE MOVEMENT STATUS DETECTION

The vehicle movement detection option is helpful to finding out the present position of the vehicle. Thus, the vehicle status can detect in such ways are either forward, backward, left and right.

E. ALERT FOR ACCIDENTS

The alert module is helpful to identify the situation of user. This module triggers the mobile GSM to send the SMS to the respective person number and indicates the critical situation of the respective user.

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IV. RESULTS AND DISCUSSIONS

Fig.4 Initialization

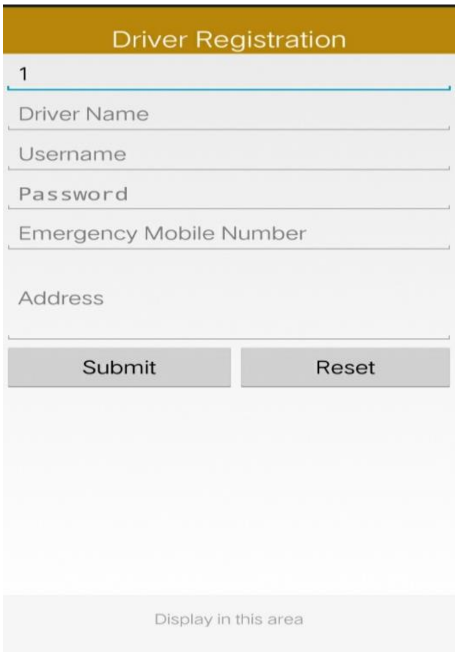

Fig.5 Registration

Fig.6 Login

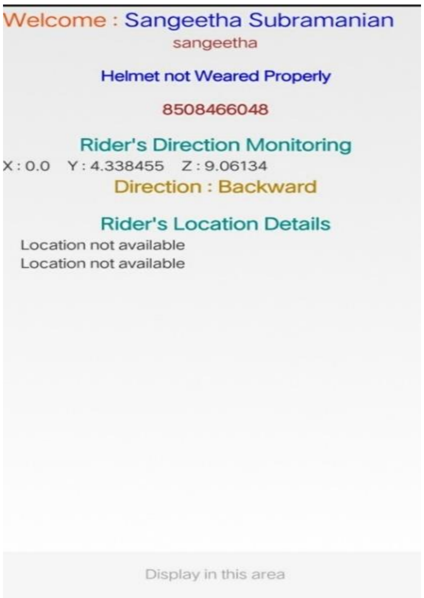

Fig.7 Checking Safety & Location

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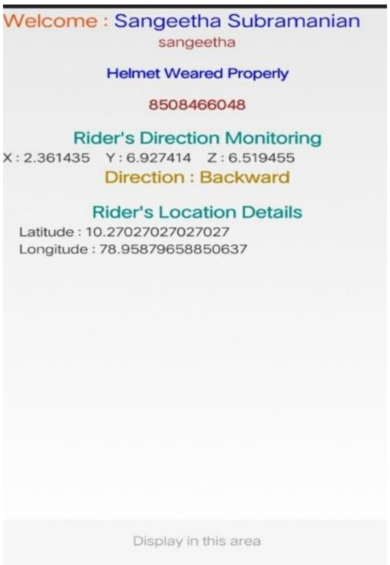

Fig.8 Tracking User Location & Monitor Vehicle Movement

V. CONCLUSION AND FUTURE SCOPE

Intelligent vehicle and driver safety system ensures the security of the vehicle which is a main issue in today's life also the security of the vehicle as the number of accidents of the drivers has a great number. To start the vehicle, it will make necessary for the driver to wear the seatbelt which is a very important substituent for the driver safety. This application will also help in tracking the vehicle if it gets stolen or dragged somehow by the thief by simply sending an SMS to the owner about the present location of the vehicle and the status regarding the position that the driver drives the vehicle.

In future the proposed work is further extended to provide some useful features such as 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. Enable the GPS location identification system to monitor the driver's present location via GPS map facilities and provides guidance to drivers in case of any emergency scenarios.

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