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A Driving Assistant in VANET by Using Android Operating System

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ABSTRACT: This paper proposes an eco-driving assistant that facilitates the user to be trained the techniques of efficient driving. But packet loss may occur due to fading errors. The assistant evaluate the driver's driving mode taking into account some environmental, vehicle's variables and a protocol is designed to reduce packet loss. Besides, tips are inferred to teach efficient driving habits. Compared to other systems, the driving assistant runs on a mobile device with Android Operating System and it does not need to install any new hardware.

KEYWORDS: component, eco-driving, automotive, Android, expert system, Driving pattern factors, VANET.

I. INTRODUCTION

Wireless cellular system have been in use since1980s. World have seen their evolutions from first to third generations. Vehicular Ad hoc Network (VANET) is a subclass of Mobile Ad hoc Network (MANET) where nodes represent vehicles that are moving at varying speed. Traffic accidents have been taking thousands of life each year. This produces high death rate than any deadly disease. India having less than 1% of the world's vehicles, the country accounts for 6% of total road accidents across the globe and 10% of total road fatalities [5].

This shows the inability of drivers to react in time of emergency situations like chain collisions, in which an initial collision is followed by a series of collisions. Many of the collisions could be avoided if the operator of the vehicle was provided warning at least one-half second prior to a collision.

Fig. 1.Vehicle to Vehicle Collision

The figure explains, if car A applies break suddenly then Collision occurs to other cars, coming at back (namely car B and car C).
Competent driving style will improve fuel efficiency and also reduce accidents.

The solution proposed is based on the use of mobile devices with Android OS. This provides an environment to execute the eco-driving assistant. Bluetooth module is also used to connect to the vehicle´s diagnostic port. This module allows transferring the vehicle telemetry to the smart phone. The eco-driving assistant exercise the information obtained through the diagnostic port with the smart phone's information to accurately model the driver´s driving style from the point of view of energy consumption.

This approach can be used on any model of vehicle and does not require any special device installed in the vehicle. Moreover, this approach is not more expensive.

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II. STATE OF ART

The objective of the eco-driving is to reduce energy consumption by applying a set of rules. These rules do not require a technological support but the cooperation of the driver [1].

The problem is that driving is a very complex task that includes multiple objectives. Complexity arises because the driver feels difficult to modify driving habits and also Driving is a very complex task in which there is multiple goals conflict with each other. To solve these issues an eco-driving assistant is used.It allows drivers to learn the rules of driving more efficiently. There are several studies like Boriboonsomsin [2] that evaluates the suitability of eco-driving assistants to make the users acquire a more efficient driving style. The use of efficient driving techniques has a positive impact on saving fuel.

Another problem is eco-driving systems should identify what factors influence energy consumption. Johansson et al. [3] recommended that maintaining low deceleration levels, minimizing the use of 1st and 2nd gears, increasing the use of same gear will improve fuel efficiency. Kuhler et al. [4] identified a set of ten variables that influence energy consumption and the emission of polluting gases. The drawback of these proposals is that they are considering their own environment and the user environment is not taken into account [5].

III. MODULES AND REQUIREMENTS

There are two modules in eco-driving assistant. They are:

- The data acquisition system and
- The expert system.

Data acquisition System: The data acquisition module is responsible for obtaining all the necessary variables to model the driver´s driving style. The hardware requirements are as follows:

- **Diagnostic Port (OBD2):** All modern vehicles have a port [2] used to diagnosis faults in the vehicle components. The interface of the port is almost all OBD2.

- **Bluetooth Adapter:** It Acts as interpreter converting diagnostic OBD2 port signals to serial data. Diagnostic port provides abundant data about engine and other parts of vehicle [11].

- **GPS:** It is used to determine the vehicle´s position. If GPS signal is not available, the network location is used to get details about road condition.
- **GPRS Connectivity:** It allows connecting to the Internet to find out the state and weather conditions of the road [12].
- **Bluetooth connectivity:** It Allows connecting mobile device Bluetooth to get the data supplied by the diagnostic port.

Expert System: The expert system module evaluates the driver´s driving style and on that basis infers and issues tips [13].

To execute expert system, mobile devices have processors at 1 GHz or even there are already devices with dual-core processors. Also tend to have 512 MB of RAM so they are powerful enough to execute complex tasks. The problem of the expert system in real time employment is discussed below:

- **Speed:** As eco-driving tips are displayed in real time is necessary for the classification algorithm is executed quickly. The tips issued now may not be valid later. The goal is to improve the system gradually [14].
- **Memory usage:** Although current mobile devices have enough memory. Classification algorithms tend to consume lots of memory, especially when the dataset is very large. Select a classification algorithm that consumes little memory and less failure due to insufficient memory.

The figure described below shows an expert system.

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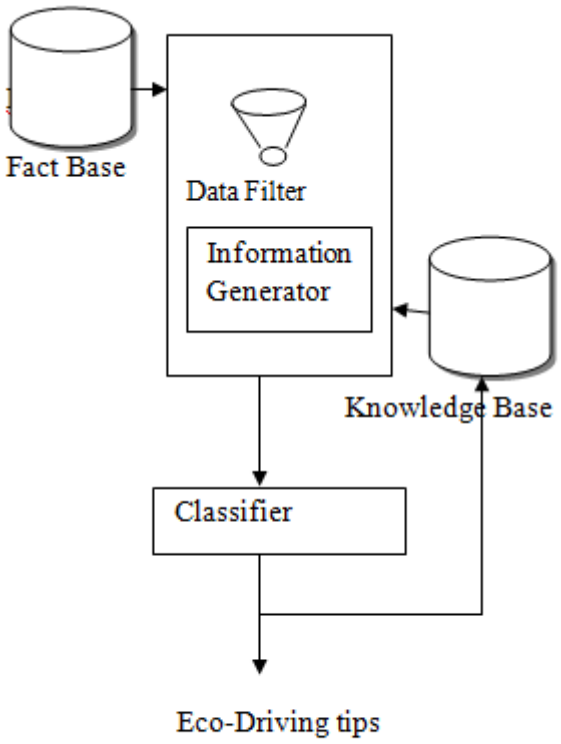

Fig. 2.Expert system

Expert system consists of the following elements. They are as follows:

- **Facts Base:** It consists in a SQL database that contains the collected data during the last ten minutes [7].
- **Preprocessing module:** It Responsible for generating a single instance from stored instances from facts base.
- **Knowledge Base:** It contains the training set that is used to determine the efficient driving tips by the classifier. Training set has been obtained by using several efficient driving manuals [6].
- **Classifier:** It is Responsible for inferring the most appropriate advice, taking into account the driver's driving style over the last 10 minutes.

IV. DADCQ PROTOCOL

DADCQ stands for Distributed Adaptive Distance with Channel Quality. DADCQ combines local spatial distribution information and other factors with the distance method to select rebroadcasting nodes. Many broadcast protocols proposed for ad hoc that make use of the distance method use less comprehensive supplemental information [9].

The DADCQ protocol utilizes the distance method to select nodes for forwarding messages. The performance of this method depends heavily on the decision threshold value. But it is difficult to choose a value that result in good performance across different scenarios. Density of the Node, spatial distribution pattern, and Quality of wireless channel all affect the optimal value [8]. This design challenge is addressed by creating a decision threshold function that is simultaneously adaptive to the number of neighbors, the node clustering factor, and the Rician fading parameter. Thus packet loss is reduced [10].

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V. CONCLUSION

In this paper, the eco driving assistant has been presented. The eco-driving assistant presented considers externals variables to the vehicle that significantly affect energy consumption. For doing this, we use the information that today's mobile smart devices allow us to get through its sensors and connectivity. The use of a Smartphone as eco-driving assistant also makes the solution cost low. The solutions take into account environmental variables that affect energy consumption. The advantage is that the evaluation of the driving style is much more accurate and less expensive. The protocol reduces the data loss effectively.

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