USAGE BASED INSURANCE

Aditya Natekar[1], Pradeep Kumar CP[2]

[1]*Bachelor of Engineering, Electronics and Communication, Dayananda Sagar College of Engineering, Karnataka, India*
[2]*Bachelor of Engineering, Electronics and Communication, Dayananda Sagar College of Engineering, Karnataka, India*

Abstract – We live in the era of advanced technology. Most of the countries with flavor of Internet of Thing (IoT) have developed exponentially in all domains .The domain which we have chosen is Insurance. In existing system, for vehicle insurance manual procedure is followed. There is a need for smart maintenance. With the increasing availability of driving operation data and vehicle information for auto insurance services, it is possible for insurance companies to provide differentiate insurance premiums and value-added services for drivers. Our project is Usage Based Insurance (UBI). With UBI how you drive affect your premium, the more safely you drive the lesser you pay. Based on driver's driving profile, insurance premiums are calculated. This differs from traditional insurance, which attempts to differentiate between rash drive and safe driver, giving them lower premiums. Insurance company keep the track of vehicle parameters like speed variation, distance covered, number of times vehicle has crossed speed limits, based on which premium is calculated. Thus complexity is reduced. Customer will be able to keep track of premiums which he/she has to pay. Insurance premium mechanism is favorable to make customers enjoy discounts and follow driving safety standards. Usage based insurance is promising and sustainable owing to safe awareness enhancement for driving safety, reasonable premiums and personalized insurance services for customers and profit improvement for insurance companies. The main aim of our project is to culture safe driving and smart insurance system. By this project implementation, mitigation of insurance based conflictions is achieved.

***Key Words*: Internet of Things (IoT), Insurance, Usage Based Insurance, Premium**

1. INTRODUCTION

Data has traditionally been one of insurance industry's greatest and more valuable assets. The ubiquity of wireless connectivity, the increasing sophistication of in-vehicle electronics and machine-to-machine (M2M) communication is presenting the auto insurance industry with a historic transformational challenge. Insurers are investing on their ability to collect, store, manage and analyze vast amounts of variable data to solve complex problems in order to remain competitive and profitable. Auto insurance is fast becoming a big data industry, with telematics-based UBI poised to potentially change the business of insurance as we know it.

The conventional system of calculating Vehicle Insurance is purely based on the redundant parameters like age of the driver, driving experience and personal details which are nowhere giving the drivers behavior and profile of driving. This new system emphasis on choosing parameters which can accurately plot the driving behavior and profile.

Time to adopt Usage Based Insurance seriously sooner than later. Customers would love the transparency. Insurer increases its insurance premiums based on the past history data by informing their consumer what you are doing wrong and why this is dangerous, hence the reason for the higher premiums. In turn, the driver can correct what he or she is doing wrong in the hopes of getting the premiums back down. Rather than just referring to some vague statistics that may or may not be applicable to the driver in question.

Insurance companies can benefit from getting new customers with the promise of possibly lower insurance premium rates. To attract their existing customer and new customers, the insurer uses grades based on the drivers' driving pattern and offer 10% to 50% insurance benefits directly to their customers to utilize in other add-on services if any.

However, insurers are providing incentives for good driving with usage-based insurance. And good driving means less claims. Claims payouts become lesser up to 50%. Insurers have less claims to process and pay out, enabling them to save more money than the additional premiums they get from traditional insurance. Insurers would be able to benefit by attracting safe drivers with lower insurance premiums and keeping away the bad drivers with insurance premiums that are more expensive than traditional insurance policies.

If you want lesser premiums, you might want driving less, biking more, carpooling more and walking more. So in effect, you would be helping the environment, while keeping yourself fit and healthy.

1.1 Overview

The explosion of digital and social platforms means new innovations in retail environments directly influence the expectations of consumers – put simply, customers expect the kind of easy and transparent experience they have in other aspects of their daily lives, from their insurer. The so-called "sharing economy" and data revolution, with its disruptive concepts of sharing services and goods and pay-per-usage, has taken firm hold in many other sectors – from ride and taxi share schemes to holiday accommodation. This poses exciting new market opportunities for insurers, as well as enormous challenges. Successful insurance brands in the future will focus on delivering flexibility and personalization in all aspects of their proposition, from product offerings to service delivery and communications – when and how customers want it. This requires simplified, transparent and flexible products with dynamic pricing and payment capabilities. Insurers who are slow to adapt and innovate will surely be left behind. Usage based insurance (UBI) provides an opportunity for insurers to tailor insurance to customers specific behaviors and usage patterns.

The innovative solution helps insurers better identify risk exposures, design differentiated products and put the control of pricing in the hands of their customers, who decide how much, and how well, they want to drive. A policyholder whose collected data shows safe driving habits can receive a lower premium than a customer exhibiting unsafe behavior on the road. The information is available via a smartphone app, weekly email updates and on the insurers' web portal, allowing customers many ways to see their driving habits and keep track of their insurance premiums. The immediacy of the feedback, along with the clear correlation to premiums, has also been shown to positively impact behavioral change among drivers. With insurers and policyholders rapidly embracing new technologies and looking for smart ways to reduce costs, "USAGE BASED INSURANCE" solutions will be an important growth trend for the next decade. Not only do they respond to the impending need for insurers to design differentiated, personalized products, they help build stronger, more frequent, engaging and meaningful relationships with customers. Vehicle telematics, integrated navigation, and computer and mobile communication technology used to directly monitor driving behavior allow insurers to use true causal risk factors to accurately assess risks and develop precise UBI rating plans. Furthermore, with premiums accurately reflecting true risks, policyholders are incentivized to adopt risk-minimizing behaviors with benefits accruing not only to consumers and insurance companies, but also to society as a whole.

1.2 Conventional Methods

Traditional methods of determining insurance rates use the information provided by the driver (like where you live, the type of vehicle you drive, your driving record, and your insurance history) coupled with the insurer's own claims and loss experience. All of this is pooled together to determine how much you'll pay for car insurance.

Conventional methods consider the following parameters to calculate the insurance premium of a vehicle. They are year of manufacture, model number, type of engine, place of region, policy type, amount to be claimed, period of insurance and policy holder personal details. Consumers want more frequent, meaningful and personalized communications. A full 57% of global insurance consumers, across all product types, prefer to hear from their providers at least semi-annually.

Today, only 47% receive that level of contact. In an era when many consumers feel bombarded by push communications and suffer from information overload, it is particularly interesting for survey respondents to express a desire for more communications. As consumers embrace digital, insurers must rethink their distribution strategies and partner relationships. While consumers still gravitate toward traditional contact methods, digital and remote options are fast reaching parity for a range of tasks and inquiries. No matter their precise distribution strategy and service models, insurers need to offer consumers the right mix of channels to maintain healthy relationships — and prepare to manage the potential channel conflict that is likely to result.

1.3 Drawbacks of the Conventional Methods

The traditional Insurance system even though it provides equality for all the customers in terms of premium to be paid, it does have some drawbacks to be look into deeply. They include

- They fail to differentiate good and bad driving habits through their parameters upon using which the insurance is generated for customers individually.
- People who use vehicle optimally end up paying the same premium to those who use more.
- Conventional methods fail to update users about their driving habits.

1.4 Technology methods going to be employed

The implementation of UBI model is very simple. The technologies used in here are as follows

- Embedded C
- Arduino Software IDE
- GSM

2. LITERATURE SURVEY

A framework is presented to deploy a smartphone-based measurement system for road vehicle traffic monitoring and usage-based insurance (UBI). Through the aid of a hierarchical model to modularize the description, the functionality is described as spanning from sensor-level functionality and technical specification to the topmost business model. The designer of a complex measurement system has to consider the full picture from low-level sensing, actuating, and wireless data transfer to the topmost level, including enticements for the individual smartphone owners, i.e., the end users who are the actual measurement probes. The measurement system provides two data streams: a primary stream to support road vehicle traffic monitoring and a secondary stream to support the UBI program. The latter data stream drives the business model and parts of the revenue streams, which ensure the funding of the total measurement system and create value for the end users, the service provider, and the insurance company. In addition to the presented framework, outcome from a measurement campaign is presented, including road vehicle traffic monitoring (primary data stream) and a commercial pilot of UBI based on the driver profiles (secondary data stream). The measurement system is believed to be sustainable due to the incitements offered to the individual end users, in terms of favorable pricing for the insurance premium. The measurement campaign itself is believed to have an interest in its own right, as it includes smartphone probing of road traffic with a number of probes in the vicinity of the current state of the art, given by the Berkeley Mobile Millennium Project.

Here, the smartphone measurement system model is introduced and defined. With the proposed model, the process of conceiving and designing a sustainable largescale smartphone-based measurement system can coherently be described. The model consists of seven layers, spanning from the physical smartphones and servers to the overall business model at the top layer.

This paper cites, the measurement probe can be used by the insurers, to approve their risk assessment; thus, through the use of these data, a particular driver's behavior can be assessed. As insurers can gain access to actual driving behavior data via the probe, the premium can be adjusted to reflect the driving habits of a driver and their related risk— so-called usage-based insurance (UBI). As a result, the insurance premium can individually be adjusted according to the driving behavior, and the likelihood of a claim related to that particular driver can be predicted. Insurers have long relied on factors such as the age of the driver and the place of residence to calculate premiums. Insurance telematics has helped the insurers to use other variables in their risk calculation. By using telematics technology, the insurers can improve the pricing accuracy and sophistication, as well as attract favorable risks. As a result, the claims costs will be reduced, which, in turn, will enable lower premiums. The technology will help the insurers to increase their overall profitability. [1] This paper cites that, Smartphone-based insurance telematics or usage based insurance is a disruptive technology which relies on insurance premiums that reflect the risk profile of the driver; measured via smartphones with appropriate installed software.

Usage Based Insurance (UBI) programs for car insurance is becoming mainstream using tailored vehicle mounted hardware. The smartphone has been identified as an enabler for future UBI, replacing the vehicle mounted dedicated hardware with a ubiquitous device with a plurality of sensors, means for data processing and wireless communication. This presentation addresses some signal processing challenges in smartphone-driven UBI. The paper views about Parameters to be used: Insurance telematics employ parameters to evaluate the risk associated with a driver of a car, like time of the day, location or road taken, distance traveled, and driving behavior characteristics like heavy breaking, acceleration, cornering, swerving, smoothness and speeding. Accordingly the risk calculation performed at the insurer is based on both dynamic characteristics like the ones above, in combination with the traditional static means like age, gender, vehicle type and age, place of residence, occupation. Usage based insurance currently includes some three million policy holders globally; a figure that is expected to grow exponentially during the next couple of years. The challenges cited by the paper: Traditional UBI hardware, on the other hand, typically relies on proprioception where the information is gathered from the vehicle, like speed data provided by the on-board diagnostics (OBD) outlet. A challenge is the proper design of signal processing algorithms with respect to the new type of information. [4]

3. OBJECTIVE

The main objective of our work is to develop a model which allows customer to customize their Insurance Premium according to their Usage

The above mentioned objective of our paper work can be achieved using the following steps one by one as follows:

1. Develop a basic hardware model, i.e. telematics device.
2. Collect rpm data from the moving vehicle.
3. Develop a naive algorithms to determine the parameters such as distance travelled, count of crossed threshold over speed limit and variation.
4. Develop rpm code, parameter code, main profile structure code which will give Insurance Premium status for the particular vehicle.
5. Display the final drivers profile on the serial monitor.
6. Update the profile to customer handset through GSM.

4. MOTIVATION

Until a driver gets a ticket or has an accident, there's really no other way to know for sure if they are a good driver. So the industry has been forced to look for other indicators. While the system is not perfect or 100 percent equitable, it's not highly efficient and has to enable hundreds of millions of drivers to get a regular check on their driving behavior.

The conventional methods of deciding the premium does not do full justice as it nowhere takes any data about how a person drive his/her vehicle, thereby the efficient drivers are being made to pay a huge amount towards the Insurance companies.

So to curb the aforementioned problems UBI can give a better solution. We, as a group, came up with this idea of implementing the proposed system and designed a telematic system which is simple and can easily be implemented.

5. PROPOSED METHODOLOGY

The proposed methodology adopted in the our project work is depicted below

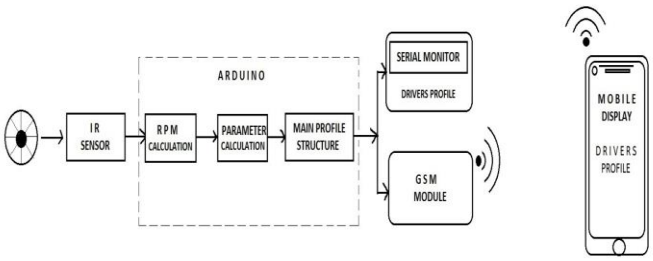

Fig. 1 : Block-diagram of the UBI

1. Block 1 gives the information about IR Sensor. An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.....
2. Block 2 gives the information about calculating of rpm using the predecessor block IR Sensor. A chromatic strip is pasted on the vehicle and IR Sensor is fixed perpendicular to the wheel. It blinks for every rotation noting from a strip to strip, taking it as one complete revolution.
3. Block 3 gives the information about parameter calculation such as Speed limit, Speed Variation and Distance covered. The algorithm is developed such as to take rpm as input to calculate all of these parameters.

4. Block 4 is the main profile structure which can be set by insurance companies to reward or impose panalty on drivers depending on being safe or rash. Output of this is nature/behaviour of driving and the final insurance premium to be paid by them. …..
5. Block 5 is a serial monitor on which the Drivers Profile is being displayed. Serial Monitor is a part of arduino where in the execution results are being displayed.
6. Block 6 is the GSM unit. This is used to send the Output to destined driver for having a check on his/her driving and implement good driving skills to combat the penalties if any.
7. Block 7 is a GSM supported mobile handset from where the customers can get regular updates and results about the driving

Finally, the result is obtained and will be presented in the final stage on a serial monitor and mobile handset , which may conclude the effectiveness of proposed methodology developed by us.

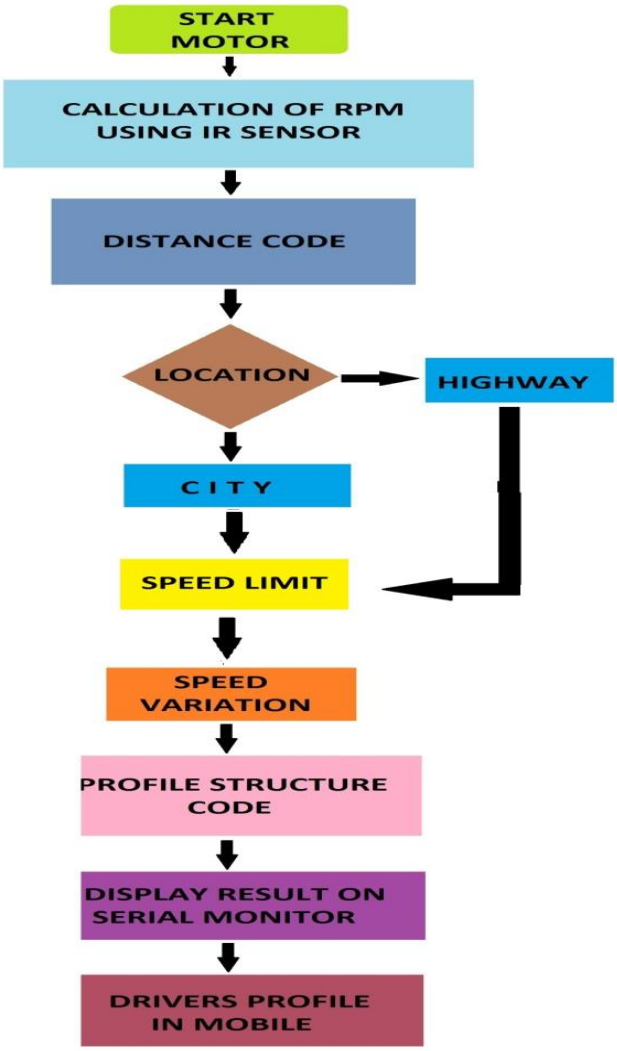

Fig. 2. Flow-Chart of the methodology used

6. WORKING OF THE MODEL

A readymade remote controlled car chassis is separated and the IR Sensor is placed / attached near vehicle tires so as to get the accurate reading of the rpm value continuously for designed time slot. IR Sensor is connected to arduino through a connector and RPM is calculated using the mentioned formula by code written in arduino ide platform. Calculated RPM value is used to determine the distance covered using the below mentioned formula. This RPM is taken as input for the upcoming calculations therefore it is stored in its flash memory. Now the user must choose the location he is driving in (city/ highway). Speed is calculated using the rpm data and is stored in a temporary register. Accordingly different thresholds for speed limits are set. Whenever the driver crosses set speed limit threshold, a count will be generated, finally after an iteration the total number of count is stored and is displayed.

To check on speed variation / hard braking, algorithms are developed to see the number of times (count) the driver did hard acceleration and hard decelerations in an unit time by taking the difference of the rpm values in an interval of time. Count is stored and displayed. Main Profile structure code is used to generate the final driving profile by making use of the rpm, exceeded count (speed limit), counts (speed variation) . Algorithms are developed to take these values as input and to generate Remarks/ behavior of driving with premium rates to be paid. The final remarks are sent to users mobile handset using GSM.

RPM Calculation:

RPM is calculated using formula

C = (1/time millis)*1000*1000*60 ……(1)

C = (60000000/duration) ……(2)

The calculated RPM value is stored for next scan.

Distance Calculation:

The distance is calculated using formula circumference formula

Circumference = 3.142*diameter

Distance = No. of revolutions*circumference ……..(4)

7. ALGORITHM

Step 1: Initialize and declare the necessary variables i.e., dia, tt, rpm1, rpm2, circum, dt, d1, c, count, d, e.

Step 2: User should give the location/ terrain in which the driver is driving i.e, Enter 1 for city or 2 for Highway.

Step 3: Obtain IR sensor reading whenever there is movement of vehicle/ change of state. rpm is calculated, stored.

Step 4: Calculate the distance covered using rpm.

Step 5: Set the threshold for city/highway speed limits. Whenever the threshold is crossed count (e) is generated and loop goes on

Step 6: Speed variation is determined by taking difference of two consecutive rpm values, if the difference is not zero and crossing the threshold, a count is generated and the loop goes on

Step 7: After stopping the vehicle, take distance travelled by driver. Compare it to the range set and see to which category he/she falls and assign the value

Step 8: With the count values from all the parameters, average is taken and the final drivers profile remarks is displayed with the premium to be paid.

8. SIMULATION RESULT

The results or the outcome of the project work could be summarized as follows

- To give the final driver profile, the designed arduino code takes all the necessary parameter outputs such as counts generated in measuring distance, speed limit and speed variation in a particular location, and generates the final output as drivers profile
- The ouput will be as follows for various conditions met depending on how a customer has driven the car.

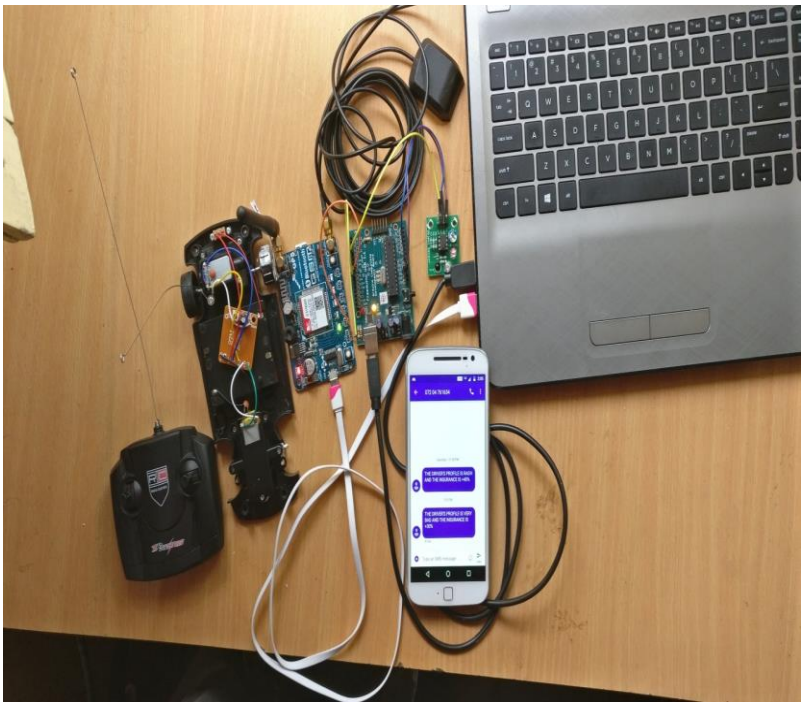

Fig. 3: Photographic view of the hardware set-up

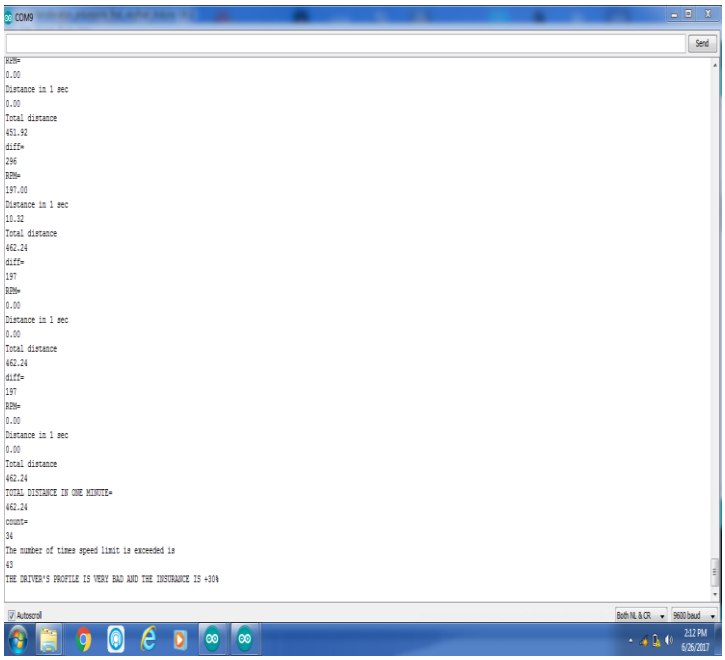

Fig. 4: Simulated result

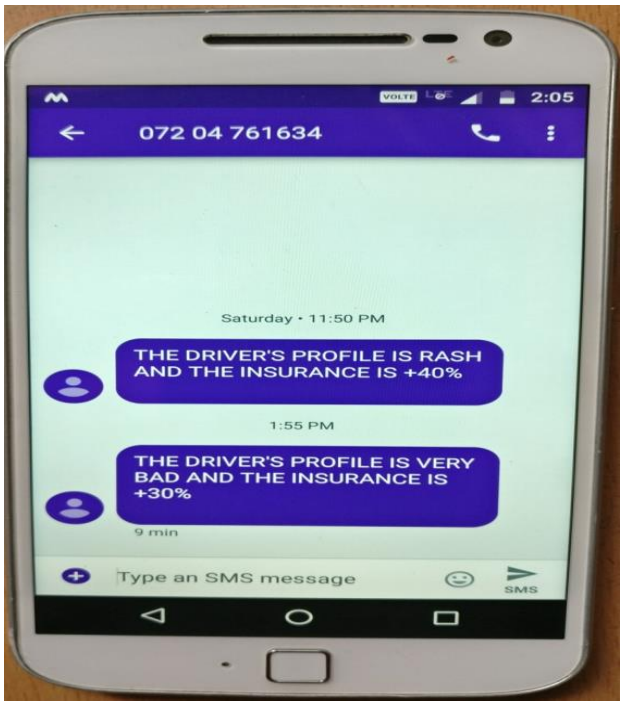

Fig. 5: Display on mobile handset

9. CONCLUSIONS

To calculate the insurance of any vehicle, primarily we need data from vehicle. To do this either we have to have an direct access to the dashboard or a device which can do that work. The device can be named "Telematic Device". We have developed a simple telematic device using the tools as above mentioned. This emphasis on collecting data from the vehicle such as speed, distance, time. The telematics continuously monitor the vehicle. It detects the variations every time when the decided parameters threshold is crossed. Thereby noting the count/number of times the threshold is crossed. The destined hardware process the data from the telematics to display the drivers profilOur designed telematic device is simple, reliable, economical and can be very easily implemented on a vehicle with the minimum hardware requirement. The drivers have complete control over the premium to be paid and is manually customizable which gives the user the freedom to regulate their vehicle expenses and maintainance.

The UBI pricing strategy promises to benefit individuals, insurance companies and the country as a whole. Many individuals will be able to reduce their insurance premiums by driving less. The overall reduction in driving will cut CO2 emissions, lessen traffic, improve public health through a reduction in car crashes, improve the nation's balance of payments and reduce the funds that go to hostile, oil-producing countries.

REFERENCES

1) Peter Handel,Senior Member IEEE, Jens Ohlsson, Martin Ohlsson, Isaac Skog, Member,IEEE, and Elin Nygren,"Smartphone-Based Measurement Systems for Road Vehicle Traffic Monitoring and Usage-Based Insurance", IEEE SYSTEMS JOURNAL, SWEDEN, 1238., Volume 8, No 4, Dec/2014.

2) Peter Handel, Isaac Skog, Johan Wahlstrom, Farid Bonawiede, Richard Welch, Jens Ohlsson, Martin Ohlsson, "Insurance Telematics: Opportunities and Challenges with the Smartphone Solution", IEEE Intelligent Transportation System Magazine, 1939-1393/14., 27th Oct/2014

3) Jiangqin Peng, Nanjie Liu, Haitao Zhao, Minglu Yu, "Usage-Based Insurance System Based On Carrier-Cloud-Client", Nanjing University of Posts and Telecommunications,China.

4) Isaac Skog, Peter Handel, Martin Ohlsson and Jeans Ohlsson, "Challenges in Smartphone-Driven Usage Based Insurance", ACCESS Linnaeus Center, KTH Royal Institute of Technology, Sweden. 978-1-4799-0248-4, 2013 IEEE

5) German Castignani, Raphael Frank and Thomas Engel, "Driver Behavior Profiling using Smart-Phones", Proceedings of the 16th International IEEE annual conference on Intelligent Transportation Systems (ITSC 2013), The Hague, The Netherlands MoD1.4,Oct 6-9/2013