Sensing The Vehicle Dash Through Gps

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Abstract: most vehicular application calculating a vehicle speed is very important. In this paper when GPS is not available vehicle speed is calculated by using sensor in the smartphone. Vehicle speed is estimated by calculating the accelerometer and find the acceleration error since it leads to large deviation between calculated speed and the real speed. The acceleration error can be corrected at a point called reference point. Vehicle speed is exactly known through reference point. In urban environment which includes many turn, passing through uneven roads to eliminate the acceleration error caused by estimated speed deviation and to derive reference point. Estimation error on real time in local road is 32mph and in offline is 0.75mph and the GPS average error is 3.1mph and 2.8mph.

Index Terms: Vehicle Dash, GPS, Sensor, Acceleration error.

1 INTRODUCTION

Vehicular application in smartphone has become more popular and effectively used in urban environment to enhance driving safety and to analyse driving behavior and to build transport system. The vehicle speed is given as input for this application.Generally GPS helps to find the driving speed of the vehicle but its availability and updates are low. GPS also drains down phone battery quickly. Besides using GPS alternatives are made by using either OBD-II interface or cell phone tower signals of smartphone [1]. The estimation of vehicle speed is accurate by sensing driving by smartphone. Here the impact of acceleration error is studied by estimating the speed result by readings of phone accelerometer. There are three kind of reference point in which speed of natural driving is infer at each reference point which reduces the accelerometer error that affects estimated vehicle speed accuracy. Once the estimation of vehicle speed i.e. Sen-Speed it acquires information from the reference point to eliminate and measure the accelerometer error and high accuracy speed is generated. This experiment is conducted in places USA and NEW YORK. The average error of real time vehicle speed is 1.32mph while it achieves 0.75mph on offline estimation [2]. Finally the remaining part of the paper is about the following: SectionII.RelatedWork, Section III. Design of SenSpeed, Section IV. Result Section V. Conclusion and Future Work, Section VI. References.

2 RELATED WORK

The Calculation of vehicle Speed is reviewed here in this section and is classified as follows. Detecting Accidents using OBD-II Interfaces in Vehicular Networks:

A. Achieving smart vehicle modeling and to offer new emergency services to Users for detecting the car accident and alerting system that combines vehicle with smart phones using a On-Board-Diagnosis Interface.

B. Wreck Watch“Automatic Traffic Accident Detection and Notification with Smartphones”: WreckWatch was a Smartphone based Webserver Application that supports to detect Accidents and Notify through GPS by Smartphone Sensors . The Major flaws with this system is the Speed Calculated by the Accelerometer is lower than the threshold value then the system will be deactivated. If it is higher than the threshold value then the system will consider it as a major Accident [3].

C. Crash Notification System for Portable Devices: Mobile Network is used to communicate between portable device and Server Center.Since Crash sensor act as a build-in Accelerometer sensor inSmartphone is the main problem that subjects high rating of false positive emerging when the user is the Outside the vehicle.

D. Utilizing the Emergence of Android Smartphones for Public Welfare by Providing Advance Accident Detection: In this Application the Driving person should not keep mobile phone along with him. It should be locked inside the car so that the Accelerometer and gyroscope well analyze left right turns, bumps and its angular motion. The main drawback is in case if the mobile phone tilt or fall it will create false alarm [4].

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2 DESIGN OF SENSPEED

A. Detection Phase:

Occurrence of Car Accident will be found out in this phase. Existence of potential Accident is determined by using the information received from GPS Receiver, Accelerometer sensor in Smartphone, is relied by this phase. Inthis phase it will analyze and records the speed Calculated by the Accelerometer and centripetal acceleration by G-force.Based on the analyzed sensor information if it detects the accident then it will extracts GPS location [5].

B. Sensing Reference Points:

Accurate speed is Calculated by Observing the set of Accelerometer readings, so that measuring the error in the reading is to be consider first. The Acceleration Error can be assume if the speed at reference points is known.

1. Sensing Turns: If the vehicle turns the angular speed and radius will be analyzed by the gyroscope information and the tangential speed of the vehicle When a vehicle makes a turn, it experiences a centripetal force, which is related to its speed, angular speed and turning radius. Thus, by utilizing the accelerate meter and the gyroscope, we can derive the tangential speed of a vehicle. The angular velocity by the centripetal acceleration where R-turning radius by the centre of the orbit circle:

$$V=a/ra \quad (1)$$

2. Sensing Stops: In a stop reference point, exact speed is figured out if the vehicle stops moving. As speed of the vehicle downs to zero. By observation the data pattern is

remarkably different which directs to vehicle's Z-axis for stop instead of moving. Readings will be plotted from the Accelerometer's Z- axis while car is moving and stops.

3. Sensing Uneven Road Surfaces: when a vehicle goes in a urban environment it may passes through bumps and potholes, the Z-axis of the car will be analyzed. Incase it the bumps occurs the front wheel hit and then the rear wheel.

C. Detection Phase Mechanism: The proposal of detection phase mechanism is expressed in the below formula: 1 equals to:

((Acc/4G+SU/140db)≥Accedent-threshold)AND (SP>24km/hr) (1)

If:

$$\left(\frac{Acc}{4b}+\frac{SU}{140db}+\frac{SSD}{2.06}\right) \geq Lowspeed-Threshold \quad (2)$$

$$\left(\left(\frac{Acc}{4b}+\frac{SU}{140db}\right)\geq Accedent-Threshold\right) \quad (3)$$

$$And(elaspsedtime<MP)$$

Where:
Acc- Acceleration variable
SP- speed event variable SU-sound event variable I-Accident detection indicator MP-maximum period SSD-speed standard deviation

4. Notification Phase: In this phase if it detects the accident and information about the location is gather by the GPS and sent it to the emergency responders. It maintains accuracy in sensing As in Figure 1.

Figure 1: *Process of Sending notification.*

Algorithm

1. Derivative dynamic time warping (DTW):

Time series occurs virtually since it is a ubiquitous form of data in all scientific discipline. Comparing one sequence with another sequence is a common task with a time series data.In some domains Euclidean distance will suffice for very simple distance measure.However, the component shapes are approximately similar for two sequences, but that component shapes does not line up in X-axis. Figure "warping" the time axis of one (or both)sequences is must to find the equality between these sequence or before averaging them preprocessing is made to achieve a better alignment. A techniquefor efficiently achieving this warping is DTW(Dynamic time wraping) which attempts without except acceleration and deceleration in the time axis to align two sequences that are similar, the algorithm is perfectly to be successful. In the Y-axis if two sequences differs then algorithm faces a problem. Affecting the entire sequences, such as different means (offset translation), differentscalings (amplitude scaling) or linear trends which are the global differences can be efficiently removed

2. Vehicle Speed Sensor (VSS):

A vehicle speed sensor generates a magnetic pulse in the form of a wave proportional to the speed of the vehicle (i.e., imagine a vehicle moving at high speed, the VSS will generate a high-frequency signal directly proportional to this). The power control module (also known as the electrical control module) uses the VSS frequency signal to manipulate multiple electrical subsystems in a vehicle, such as fuel injection, ignition, cruise control operation, torque, and clutch lock-up.

4 RESULTS AND DISCUSSION

Home Page of our Application. This will leads to the login page after touching this home page. Login page registration is must for using this application.

Figure 2: *The Home Page Application performing*

This is the Login page here two numbers will be asked such that one is for voice alert and another is for text alert if accident occur.

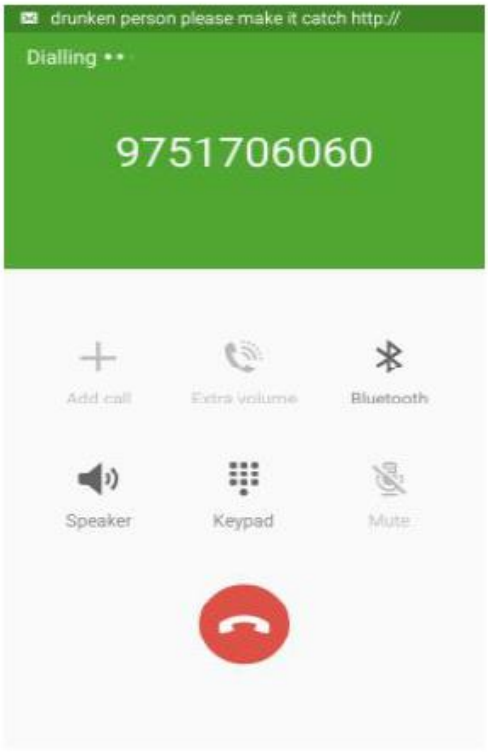

Figure 3: *Receiving the call alert.*

Call Alert received by the given number which was registered in the login page. Text Alert contain message of existence of accident and with the link which shows the location.

5 CONCLUSION

This paper will help us to address the vehicle speed calculation. Smartphone sensor is used to sense the driving condition such as turns,vehiclestopping anduneven road surfaces. After sensing everything it detects the occurrence of potential accident then it gives the message alert about the crash with the location link in that message to the number which was registered in the login page and it also provide a call alert to the same number. In Future Enhancement this paper will be used in terms providing a In-build sensor which act as a part of the car so we may avoid the OBD-II Interface and enhancement will ensure about the assurance of accurate estimation of the vehicle speed.Duration of receiving the notification about the abnormal condition will be reduced.

REFERENCES

[1] jiadiYu,Hongzi Zhu,Haofu Hanand , jieYang"SenSpeed:Sensing Driving Conditions to Estimate Vehicle Speed in Urban Environments"Transaction On Mobile Computing, VOL.15, NO.1,January 2016.

[2] National Highway Traffic Safety Administration (NHTSA), Dept. of Transportation (U.S),"*Traffic safety facts 2012: Young Drivers",* Washington (DC), April 2014.

[3] Evanco and William M., "*The Impact of Rapid Incident Detection on Freeway Accident Fatalities',* technical report available from Mitretek (center for information system), McLean, Virginia, USA, report No. WN 96W0000071, June 1996.

[4] Peter T. Martin, Joseph P. and Hansen B.," *Incident Detection Algorithm Evaluation* ", final report available from Utah Department of Transportation, USA, Vol. 1, Issue 1, Part 122 of MPC report, March 2001.

[5] Chris T., White J., Dougherty B. , Albright A. and Schmidt DC.," *WreckWatch: Automatic Traffic Accident Detection and Notification with Smartphones ",* International Journal of mobile.