IFERP
connecting engineers... developing research

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 3, March 2018

Automatic Vehicle Accident Detection System

[1] K.Saranya , [2] P.Kowsalya, [3] G.Nandhini, [4] K.Pooja
[1][2][3][4]Department of Computer Science and Engineering, V.S.B.Engineering College, Karur, Tamil Nadu

***Abstract* – The quick development of innovation and framework has made our lives less demanding. The appearance of innovation has likewise expanded the movement dangers and the street mischances happen every now and again which causes immense death toll and property as a result of the poor crisis offices. This paper manages impact and risk location for cruisers by means of inertial estimations. The Microcontroller, GPS, Ultrasonic sensor are getting synchronized with the baud rate of 9600. The microcontroller persistently read the incentive from accelerometer. On the off chance that any progressions found in the accelerometer position. It is contrasted with the past position with distinguish the mischance and furthermore sense the auto motor status and in addition the ultrasonic sensor esteem. The above status is valid, at that point read the GPS esteem and send the area to every one of the healing facilities, adjacent emergency vehicle focuses and furthermore for police with respect to the same. In the event that lone the accelerometer position is changed and keeping in mind that the motor status is in off, at that point the GPS area is sent to the close workshop in regards to the puncher and any blame found in the vehicle. The strategy is tried in a simulation environment; the correlation with a benchmark strategy demonstrates the benefits of the proposed approach.**

Index Terms— Airbag deployment, hazard detection,motorcycle dynamics, self-organizing map (SOM).

INTRODUCTION

Electronic safety systems are becoming more common in light-duty vehicles and their efficacy in saving human lives has been widely proven by accident statistics. They are classified in two categories, passive and active safety systems.Active safety systems try to predict and prevent hazardous conditions by interacting with the driver or acting directly on the vehicle. Antilock braking system[1], traction control[2][3], and electronic stability control are all examples of active systems. They recognize dangerous conditions by monitoring the vehicle state and act on the available control variables (e.g., steering angle, brakes, and engine torque). However, hazardous conditions can be consequence of other vehicles or the environment. Extending the sensor layout to include environment information can further improve safety. For example, vision systems are employed to avoid unwanted lane changes[4], ultrasonic sensors are used to prevent lateral collisions at low speed [5] and radar-based systems can predict exchange frontal collisions[6] by braking automatically. Another trend of research in active systems is based on the cooperative driving paradigm, according to which vehicles are able to communicate and information with infrastructure and other vehicles helping each other to avoid dangerous situations[7].

The primary function of passive safety systems is to mitigate the effects of hazardous conditions after they have happened. Hazardous conditions may lead to occupant injuries; collisions, roll-overs and falls are all examples of hazardous conditions. Passive systems include mechanical solutions, such as safety cells and seat belts, and electronic solutions, such as airbags or pre-tensioning seat belts. The latter require a detection system that detects the hazard occurrence and activate the system. The efficiency of electronic passive safety systems is thus strongly related to the capability to detect hazards in time. Although lately active systems seem to benefit of most of the research effort, passive systems have margin of improvements especially in the context of light duty vehicles, such as small electric vehicles, narrow track vehicles, and motorcycles. In the past years, most of the research and industrial efforts have been devoted to cars. Recently, however, safety systems for motorcycles are attracting interests[8]. Motorcycle often requires ad hoc solution because their dynamics is richer than the dynamics of four wheeled vehicles.

The sensor technology and layout considerably influence the design of the detection algorithms and their performance. Commercial airbags employ MEMS accelerometers. The closer the accelerometer is to the impact point, the more rapidly the impact is picked up by the sensor. Ideally, one would like to have a number of sensors positioned in different points of the vehicle so to effectively monitor all possible impact points. The drawback is that empirical threshold-based methods are difficultly tuned for a large number of sensors. For example, the methods disclosed in patents are based on thresholds, but the documents do not provide a systematic approach to tune those activation thresholds. Automatic feature extraction and classification alleviates this issue, making the design of detection system that effectively employ a large number of sensors easier and more cost-effective. The method proposed in this paper implements this idea using a two-phase detection algorithm based on self-organizing maps (SOMs). This approach has several

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 3, March 2018

advantages: 1) it automatically handles a large number of inputs; 2) it is capable of discriminating regular driving, from road irregularities (e.g., pot-holes) and hazards (falls and crashes); and 3) it can be trained using only safe driving conditions without the need of executing crash tests. To the best of our knowledge [9]is the only paper that employs a pattern recognition approach for motorcycle hazard detection. The authors propose a three-accelerometer sensor layout: 1) one accelerometer is placed on the driver's head; 2) one on the torso; and 3) one accelerometer is placed on the rear of the motorcycle (i.e., nine acceleration measurements). A maximum a posteriori classifier is trained to classify crashes and normal driving. Although the method is effective in recognizing dangerous events, the paper lacks an analysis of the detection delay, which can be critical due to the sensor layout. In addition, accelerometers placed on rider body measure the crash event after the rider has suffered the crash, and consequently there is a risk for a too late airbag deployment.

Fig. 1. Test vehicle and sensors set-up. Wheel accelerometers (rectangle),body accelerometers (oval).

The proposed solution is applied to a motorcycle hazard detection system through accelerometer and gyro measurements, nevertheless the presented method is suitable for different vehicles and different types of sensors. The main challenge for inertial based detection algorithms is to distinguish road irregularities (e.g., potholes) from hazards. Both situations generate high accelerations, but different safety systems may need to react differently; for example an airbag should open only in the event of a hazard (crash, motorcycle fall, etc.), whereas other systems may be designed to intervene also for road irregularities. De Filippietal[10]described an example of a system that acting during road irregularities. The authors propose a semi-active steering damper aimed at improving two-wheeled vehicles steering stability. Savaresi and Spelta[11] proposed an algorithm for semi active suspensions control in road vehicles. The classification algorithm achieves this discrimination by implementing a two phase method: the first phase detects anomalous situations, while the second phase carries out a finer event classification distinguishing hazards from known and noncritical anomalies. Both phases are carried out by an SOM.

The results presented in this paper are obtained with a state of-the-art simulator that is first calibrated and validated using data collected on a real motorcycle. The use of the simulator enables a more detailed explanation of the tradeoffs involved in the design of the system. Crash tests data are extremely costly to obtain and only represent a subset of all possible critical scenarios that a motorcycle rider could encounter; a simulation can better show the advantages of the proposed algorithm. Furthermore, although the algorithm is described using simulation data, the results presented hereafter are directly applicable to experimental data.

II.RELATED WORK

Zaldivar, Jorge, Carlos T. Calafate, Juan Carlos Cano, and Pietro Manzoni. "Providing accident detection in vehicular networks through OBD-II devices and Android-based smartphones,"The increasing activity in the Intelligent Transportation Systems (ITS) area faces a strong limitation: the slow pace at which the automotive industry is making cars "smarter". On the contrary, the smartphone industry is advancing quickly. Existing smartphones are endowed with multiple wireless interfaces and high computational power, being able to perform a wide variety of tasks. By combining smartphones with existing vehicles through an appropriate interface we are able to move closer to the smart vehicle paradigm, offering the user new functionalities and services when driving. In this paper we propose an Android- based application that monitors the vehicle through an On Board Diagnostics (OBD-II) interface, being able to detect accidents. Our proposed application estimates the G force experienced by the passengers in case of a frontal collision, which is used together with airbag triggers to detect accidents. The application reacts to positive detection by sending details about the accident through either e-mail or SMS to pre-defined destinations, immediately followed by an automatic phone call to the emergency services. Experimental results using a real vehicle show that the applica- tion is able to react to accident events in less than 3 seconds, a very low time, validating the feasibility of smartphone based solutions for improving safety on the road.

Amin, Md Syedul, Jubayer Jalil, and M. B. I. Reaz. "Accident detection and reporting system using GPS, GPRS and GSM technology."Speed is one of the basic reasons for vehicle accident. Many lives could have been saved if emergency service could get accident information and reach in time. Nowadays, GPS has become an integral part of a vehicle system. This paper proposes to utilize the capability of a GPS receiver to monitor speed of a vehicle and detect accident basing on monitored speed and send accident location to an Alert Service Center. The GPS will monitor speed of a vehicle and compare with the previous speed in every second through a Microcontroller Unit. Whenever the speed will be below the specified speed, it will assume that an accident has occurred. The system will then send the accident location acquired from the GPS along with the time and the speed by utilizing the GSM network. This will help to reach the rescue service in time and save the valuable human life[12].

White, Jules, Chris Thompson, Hamilton Turner, Brian Dougherty, and Douglas C. Schmidt. "Wreckwatch: Automatic traffic accident detection and notification with smartphones."Traffic accidents are one of the leading causes of fatalities in the India. An important indicator of survival rates after an accident is the time between the accident and when emergency medical personnel are dispatched to the scene. Eliminating the time between when an accident occurs and when first responders are dispatched to the scene decreases mortality rates by 6%. One approach to eliminating the delay between accident occurrence and first responder dispatch is to use in-vehicle automatic accident detection and notification systems, which sense when traffic accidents occur and immediately notify emergency personnel[13].These in-vehicle systems, however, are not available in all cars and are expensive to retrofit for older vehicles. It describes how smartphones, such as the iPhone and Google Android platforms, can automatically detect traffic accidents using accelerometers and acoustic data, immediately notify a central emergency dispatch server after an accident, and provide situational awareness through photographs, GPS coordinates, VOIP communication channels, and accident data recording. It provides the following contributions to the study of detecting traffic accidents via smartphones: (1) we present a formal model for accident detection that combines sensors and context data, (2) we show how smartphone sensors, network connections, and web services can be used to provide situational awareness to first responders, and (3) we provide empirical results demonstrating the efficacy of different approaches employed by smartphone accident detection systems to prevent false positives.

III.EXISTING SYSTEM

It is common scenario that people die unnoticed during accidents, especially during night time. Communication is possible only through telephone calls. There is no system to inform the rescue forces when the driver is seriously injured. During night time most of the accidents are unnoticed which leads to loss of life. Even though the technology is developed road accidents are increasing day by day.

DISADVANTAGES IN EXISTING SYSTEM:
1.It is very difficult to identify accidents in night time.
2. It took a very long time to identify the accident location and reach at the location without knowing the route.

IV.PROPOSED SYSTEM

The proposed system deals with an automatic accident detection system involving vehicles which sends information about the accident including the location, the time and angle of the accident to a rescue team like a first aid center and the police station. This information is sent in the form of an alert message. But in the cases where In there are no casualties a switch is provided which can be turned off by the driver to terminate sending the alert message. A GSM module is used to send the alert message and a GPS module is used to detect the location of the accident. The GPS and GSM module are interfaced to the control unit using serial communication .The accident itself is detected using sensor. Accelerometer sensor also helps in measuring the angle of roll over of the car. A 32-bit ARM controller is used as the main high speed data-processing unit. The vibrations are sent from the vibrating sensor to the controller after passing through an amplifying circuit. Similarly the roll over angle is sent from the sensor to the controller.

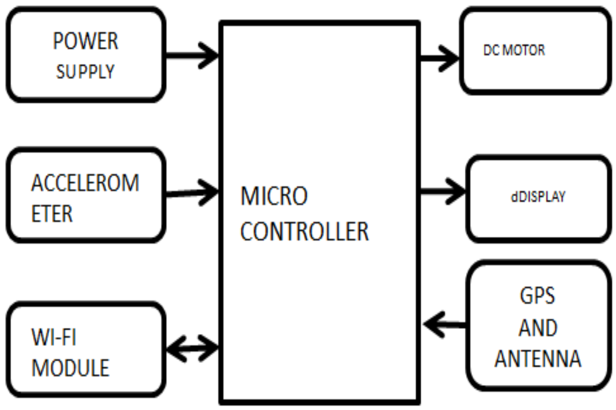

Fig 2 System Architecture

ADVANTAGES OF PROPOSED SYSTEM

1.Sophisticated security
2.Monitors all hazards and threats.
3.Low power hardware components being used in our system.
4.Use of more than one sensor increases the accuracy of our system

V.EXPERIMENTAL ANALYSIS

our system we focused to detect the accidents in road side, highway road, we designed this project to avoid rescue system delay to accident spot. We share accident spot (GPS) to local rescue system using IOT. This system will alert the ambulance quickly, we used accelerometer to detect accident with conform of vehicle speed, the module was located in bottom of vehicle to avoid sensor loss while on accident, we fixed this position after researching damaged vehicle.

MODULE DESCRIPTION

Detecting x, y, z axes:Accelerometer sensor is fitted under the car which gives the status of X,Y,Z axes . Car is moving normally when the three axes ratio is normal. When the ratio of three axes changes all of sudden, that means the position of the car has changed completely.
Notify to hospitals:When the axes changes, Wi-Fi driver which is connected to internet will notify the message to the nearby hospitals.
Detecting speed:When the hospitals receive the sensed message they will first look for the speed of the cars. If the speed is high they will consider it as an accident and detect location through GPS and send ambulance to that particular location.

VI.CONCLUSION AND FUTUREWORK

An innovative wireless system using Accelerometer and GPS tracking system has been developed for vehicle accident detection and reporting. This vehicle accident detection and reporting systems provide crucial information to emergency responders in the earliest possible time. The crucial time between the accident and getting victim medical attention can often be the difference between life and death. This system provides better safety rather than no safety. In future we can interface with GSM and Human sensor. This will optimize the proposed technology to the maximum extent and deliver the best accident detection system.

VII.REFERENCES

.[1] M. Corno, M. Gerard, M. Verhaegen, and E. Holweg, “Hybrid ABScontrol using force measurement,” IEEE Trans. Control Syst. Technol., vol. 20, no. 5, pp. 1223–1235, Sep. 2012.

[2] F. Borrelli, A. Bemporad, M. Fodor, and D. Hrovat, “An MPC/hybridsystem approach to traction control,” IEEE Trans. Control Syst. Technol.,vol. 14, no. 3, pp. 541–552, May 2006.

[3] M. Tanelli, C. Vecchio, M. Corno, A. Ferrara, and S. M. Savaresi,“Traction control for ride-by-wire sport motorcycles: A second-ordersliding mode approach,” IEEE Trans. Ind. Electron., vol. 56, no. 9,pp. 3347–3356, Sep. 2009.

[4] B.-F. Wu, W.-H. Chen, C.-W. Chang, C.-J. Chen, and M.-W. Chung,“A new vehicle detection with distance estimation for lane changewarning systems,” in Proc. IEEE Intell. Veh. Symp., Istanbul, Turkey,Jun. 2007, pp. 698–703.

[5] K.-T. Song, C.-H. Chen, and C.-H. C. Huang, “Design and experimentalstudy of an ultrasonic sensor system for lateral collision avoidance atlow speeds,” in Proc. IEEE Intell. Veh. Symp., Parma, Italy, Jun. 2004,pp. 647–652.

[6] Y. Wei, H. Meng, H. Zhang, and X. Wang, “Vehicle frontal collisionwarning system based on improved target tracking and threat assessment,” in Proc. IEEE Intell. Transp. Syst. Conf. (ITSC), Seattle, WA,USA, Sep. 2007, pp. 167–172.

[7] J. Huang and H.-S. Tan, “Design and implementation of a cooperativecollision warning system,” in Proc. IEEE Intell. Transp. Syst.Conf. (ITSC), Toronto, ON, Canada, Sep. 2006, pp. 1017–1022.

[8] M. Corno, G. Panzani, and S. M. Savaresi, “Single-track vehicledynamics control: State of the art and perspective,” IEEE/ASME Trans.Mechatronics, vol. 20, no. 4, pp. 1521–1532, Aug. 2015.

[9] J. Parviainenet al., “Automatic crash detection for motor cycles,” inProc. IEEE Ind. Electron. Soc. 40th Annu. Conf. (IECON), Dallas, TX,USA, 2014, pp. 3409–3413.

[10] P. De Filippi, M. Tanelli, M. Corno, S. M. Savaresi, and L. Fabbri,“Semi-active steering damper control in two-wheeled vehicles,” IEEETrans. Control Syst. Technol., vol. 19, no. 5, pp. 1003–1020, Sep. 2011.

[11] S. M. Savaresi and C. Spelta, “A single-sensor control strategy for semiactivesuspensions,” IEEE Trans. Control Syst. Technol., vol. 17, no. 1,pp. 143–152, Jan. 2009.

[12]Amin, Md Syedul, Jubayer Jalil, and M. B. I. Reaz. "Accident detection and reporting system using GPS, GPRS and GSM technology." In Informatics, Electronics & Vision (ICIEV), 2012 International Conference on, pp. 640-643. IEEE, 2012.

[13] White, Jules, Chris Thompson, Hamilton Turner, Brian Dougherty, and Douglas C. Schmidt. "Wreckwatch: Automatic traffic accident detection and notification with smartphones." Mobile Networks and Applications 16, no. 3 (2011): 285.

[14] A. Baraldi and P. Blonda, “A survey of fuzzy clustering algorithms forpattern recognition. I,” IEEE Trans. Syst., Man, Cybern. B, Cybern.,vol. 29, no. 6, pp. 778–785, Dec. 1999.

[15] A. Baraldi and P. Blonda, “A survey of fuzzy clustering algorithms forpattern recognition. II,” IEEE Trans. Syst., Man, Cybern. B, Cybern.,vol. 29, no. 6, pp. 786–801, Dec. 1999.

[16] T. Kohonen, E. Oja, O. Simula, A. Visa, and J. Kangas, “Engineeringapplications of the self-organizing map,” Proc. IEEE, vol. 84, no. 10,pp. 1358–1384, Oct. 1996.

[17] W. Hu, D. Xie, T. Tan, and S. Maybank, “Learning activity patternsusing fuzzy self-organizing neural network,” IEEE Trans. Syst., Man,Cybern. B, Cybern., vol. 34, no. 3, pp. 1618–1626, Jun. 2004.

[18] H. Yin and N. M. Allinson, “Self-organizing mixture networks for probabilitydensity estimation,” IEEE Trans. Neural Netw., vol. 12, no. 2,pp. 405–411, Mar. 2001.

[19] E. López-Rubio, “Probabilistic self-organizing maps for continuousdata,” IEEE Trans. Neural Netw., vol. 21, no. 10, pp. 1543–1554Oct. 2010.

[20] H. Yin, “ViSOM-a novel method for multivariate data projection andstructure visualization,” IEEE Trans. Neural Netw., vol. 13, no. 1,pp. 237–243, Jan. 2002.

[21] T. Kohonen, “Things you haven’t heard about the self-organizing map,”inProc. IEEE Int. Conf. Neural Netw., San Francisco, CA, USA, 1993,pp. 1147–1156.

[22] P. De Filippi, M. Tanelli, M. Corno, S. M. Savaresi, and M. D. Santucci,“Electronic stability control for powered two-wheelers,” IEEE Trans.
Control Syst. Technol., vol. 22, no. 1, pp. 265–272, Jan. 2014.

[23] P. D. Filippi, M. Tanelli, M. Corno, S. M. Savaresi, and L. Fabbri,“Semi-active steering damper control in two-wheeled vehicles,” IEEETrans. Control Syst. Technol., vol. 19, no. 5, pp. 1003–1020, Sep. 2011.