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# AlertRide: Accident Detection and Response

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## ABSTRACT

The escalating frequency of road accidents, particularly those involving two-wheelers, has become a critical concern, often resulting in fatal outcomes exacerbated by delayed medical assistance. This paper presents AlertRide, a comprehensive system designed to swiftly detect and report two-wheeler accidents, thereby reducing response time and improving the chances of timely medical intervention. AlertRide integrates advanced technologies like GPS, GSM, and Accelerometer, along with a dedicated Android application, to enhance the effectiveness of accident detection and notification. Most of car crash is due to careless driving that causes enoromous economic and social loss, as well as injuries and fatalities. As a result of which the research of precise impact and accident detection systems is very significant issues in management of automotive and user safety.Several crash detection algorithms are developed, but the coverage of these algorithms are not appliable to few scenarios. Road scenes and situations need to be considered in order to expand the scope of a collision detection system to include a variety of collision modes. The proposed algorithm effectively takes into consideration all the x, y, and z axes of the sensor, while involving time and predicts a method suitable for various real life problem. To reduce nuisance and false crash detection events, the algorithm categorises between driving mode and parking mode. The performance of the algorithm based on various possible scenarios is the required neccesity of the model

**Keywords:** Accident detection, alert system, GPS, GSM, Accelerometer, Android application.

## I. INTRODUCTION

The significant increase in the incidence of road accidents due to increased vehicle use and increasing pressure in today's society reveals the need to use road protection and rapid response systems that prevent collisions. A plenty of technology has been aimed to research the crash detection in vehicle. Collision probability data generated from Monte Carlo simulation taking driver behavior and vehicle dynamics into account, tracking algorithm using interactive multi-model particle filter, and threat assessment algorithm to estimate collision probability . In another method, two models are considered: a model in which the follower maintains a safe distance and a model in which the follower maintains a safe time. Analyze distance delays and time delays caused by major vehicles' impact on followers. There is also a way to develop new challenging benchmarks for stereo, optical flow, visual odometer/SLAM and 3D object detection tasks using autonomous driving platforms. The motion sensor method uses a complex motion processor to provide very accurate data and, if used near the engine, can also filter out vibrationsTo meet this critical need, AlertRide was developed as a groundbreaking solution that provides an integrated system for automatic incident detection and instant notification. The system attempts to solve this growing problem by leveraging sensors such as accelerometers and GPS technology built into modern smartphones, quickly notifying emergency services and identifying residents with the unfortunate situation of the problem

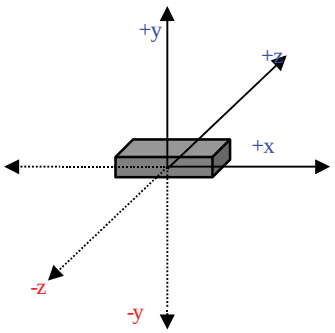


Fig. 1. G-sensor (accelerometer) axes

 

## II. MOTIVATION

The motivation behind the development of AlertRide stems from the alarming rise in road accidents and the subsequent challenges associated with delayed emergency response times. As vehicular traffic continues to surge, the need for a proactive and intelligent accident detection and notification system becomes increasingly evident. A novel algorithm for vehicle crash detection both driving and parking mode is presented. The purposed system concept includes a crash detection and safety distance calculation. The system detects the distance between the vehicle and the vehicle front (object) and uses vehicle CAN signal information from other devices. Moreover, by considering the situation over time, a shock event algorithm that is more suitable for the real world. It describes the major concept how the purposed idea works,supported by the experimental results from purposed designs. Finally,before proposing the future of study there are various methods for determining the crash. AlertRide seeks to bridge this crucial gap by harnessing cutting-edge sensor technologies and seamless integration with smartphones, thereby striving to significantly reduce the time between an accident occurrence and the initiation of emergency response procedures.

## III. OBJECTIVE

The primary objectives of AlertRide encompass the creation of a robust system capable of automating the detection of two-wheeler accidents and promptly alerting relevant stakeholders. By employing accelerometers to discern sudden changes in motion indicative of an accident and GPS technology to pinpoint precise accident locations, the system aspires to contribute to a swifter and more effective emergency response. Additionally, the development of a user-friendly Android application aims to enhance accessibility and user engagement, facilitating widespread adoption and utilization of the AlertRide system

## IV. BACKGROUND

There are many ways to detect a collision using images or driving technology, but in this article, we propose a simple approach, a method using gravity sensors.

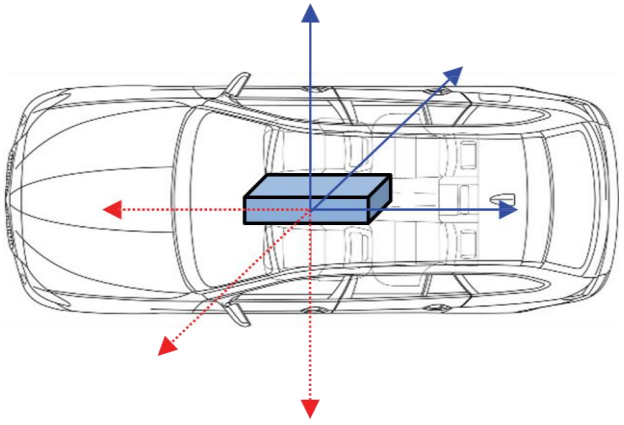

Fig. 2. Vehicle layout of gravity sensor (G-sensor)

## V. PROBLEM DEFINITION

The increase in the number of vehicles has a good correlation with all accidents in the accident, resulting in huge loss of life, mainly because medical care is affected. The magnitude of this problem underscores the urgent need to develop and implement advanced systems to facilitate emergency alerts and investigations. A fast and green alert system is important to reduce injuries and speed up the search, thus meeting many needs related to the increasing number of traffic accidents. This article aims to shed light on the overall accident picture and highlight the need for solutions including AlertRide, which seek to bridge the gap between accident notification systems, time and response.

## VI. PROPOSED METHOD

The principal objective of this research paper centers on the development of an innovative mobile application designed to harness the capabilities of embedded sensors, specifically GPS and Accelerometer, for collision detection. A Sensor Fusion Based Algorithm serves as the foundational framework, enabling the application to discern sudden external disturbances in speed, indicative of a potential collision event.

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COLLISION DETECTION ALGORITHM

The core functionality of the proposed system relies on the utilization of the Accelerometer sensor data to identify abrupt alterations in mobile phone motion. In the event of a collision or significant external disturbance, the system promptly initiates an alert message to notify the user. This preemptive notification mechanism serves

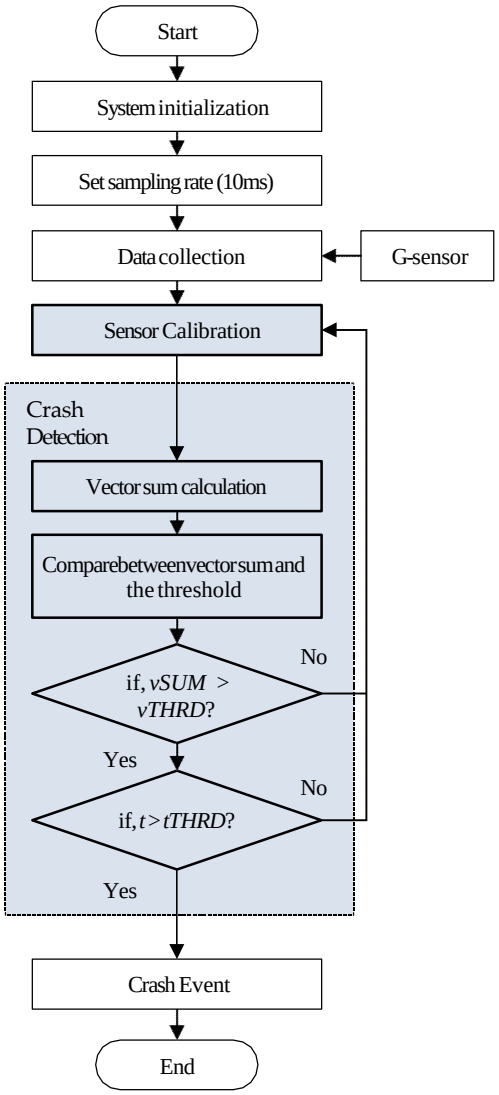


Fig 3. Purposed flow chart of collision detection.

as a crucial step before triggering the formal request for assistance, affording the user an opportunity to assess the situation and cancel the alert within a designated timeframe of 10 seconds if no emergency assistance is required.

USER INTERACTION

To further augment user control and autonomy, the proposed system incorporates a user-friendly interface, allowing individuals to initiate or cancel assistance requests with ease. The integration of this feature aligns with the overarching goal of providing users with a seamless and intuitive experience while enhancing the overall efficacy of the collision detection and emergency response system.

## VII. SYSTEM ARCHITECTURE

The proposed system is designed to address the detection and reporting of vehicle accidents through an integrated architecture. There are various methods for determiningthe crash event, using images or using autonomous driving techniques, but in this paper, we propose a method using g-sensorThe primary modules include the Accident Detection Module, Location Detection Module, and Vehicle Unit, each contributing to a comprehensive solution

aimed at minimizing response time and providing timely medical assistance. The raw values of the accelerometer are read by the microcontroller and are obtained by using complementary filters to perform data fusion. In this case, the accelerometer is used to correct the drift of the gyroscope. Complementary filter is an equation that creates a weighted arithmetic mean.

A. Accident Detection Module

The external disturbance, indicative of a potential accident, is detected by the Accident Detection Module. Upon detection, a function is invoked to determine the user's current location using the GPS in the Location Detection Module. The obtained GPS data is subsequently transmitted to emergency services to initiate a request for help.

B. Location Detection Module

The Location Detection Module interfaces with the Accident Detection Module to extract and relay the real-time coordinates of the user's location. Leveraging GPS technology, this module ensures accurate and timely information is sent to emergency services, facilitating a swift response to the reported accident.

C. Vehicle Unit

The Vehicle Unit is equipped with an accelerometer that continuously reports the coordinates of the vehicle's position to the microcontroller. In the event of a collision, the GPS location tracker within the Vehicle
Unit tracks and transmits pertinent information, Includes latitude, longitude and Google Maps location using GSM SIM module. Persons to be contacted in case of emergency, such as the police control room and ambulance, receive dispatch messages.

II. SYSTEM OPERATION

The system has a dual function, focusing on accident prevention and timely warning of accidents. Precautions include installing accelerometers and using additional warning devices such as buzzers and LED lights. The central microcontroller (Arduino Uno) manages the integration of these devices and provides efficient communication between models.

III. ACCIDENT DETECTION AND REPORTING

Accelerometers detect vehicle accidents, signaling the microcontroller to initiate further actions. The GPS module provides real-time information on location, speed, time, and date, facilitating precise accident documentation. Upon accident detection, the microcontroller orchestrates the transmission of accident

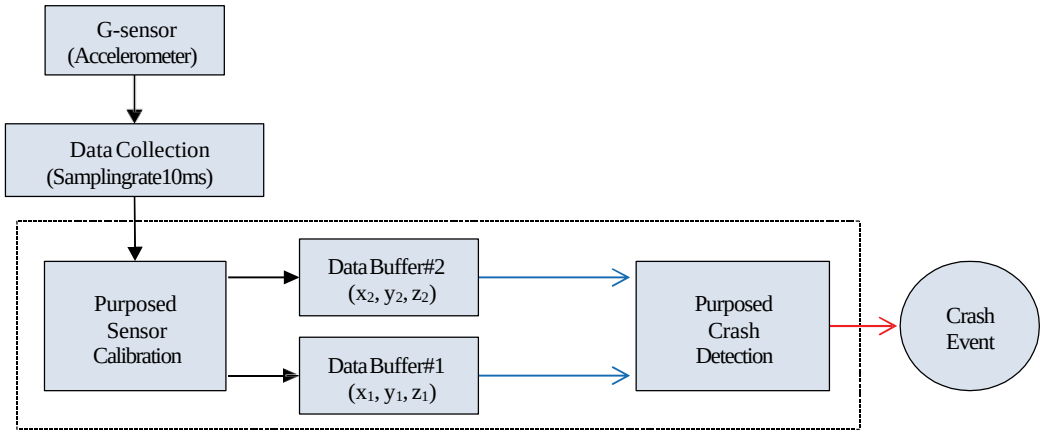


Fig.4 Architecture of pruposed system

details via the GSM module to emergency services, including ambulance and police units.

## IV. SYSTEM INSTALLATION

The Arduino setup is placed on crash shields or bumpers on both sides of the car. A button is activated to notify the Arduino board if a crash occurs. Control is transferred from the GSM module to the cell type described earlier. Directions include shared locations in the form of Google Maps links and help emergency responders respond directly to crash situations.

## VIII. MODEL AND PROJECT DESCRIPTION

A. Arduino

Arduino UNO is a widely used open source microcontroller board that works amidst control and notification of events at the input. Created by Arduino.cc and based on the ATmega328P microcontroller, this device acts as a central hub to collect data from devices such as vibration sensors, GPRS and GSM modules. Arduino then analyzes this data and provides relevant information via configuration or SMS notification. Vibration sensors play an important role in vehicle vibration detection and are important models in accident detection. Accurate sensor calibration is key to obtain reliable ground information. The calibration pipeline proceeds as follows: we calibrate the g-sensor intrinsically and extrinsically and rectify the input data. If the sample rate is low, the amount of collected data is increased as well as it causes computational complexity.

B. GSM Modules

Use GSM SIM900 module to achieve communication between GPS, GSM and mobile phone. The EGSM900 MHz operates in the tri-band spectrum covering frequencies from 900 MHz to 1900 MHz, including PCS 1900 MHz and DSC 100 MHz, creating important communication channels. The interaction between the module and the mobile phone occurs through the receiver pins of the GSM module and the transmitter pins of the GPS module. This module plays an important role in sending relevant information to the intended recipient. Existing techniques for this work were necessary because they were not accurate enough to calculate ground-based estimates. We suggest a method to increase the accuracy of data. The sample rate plays a significant role in collecting accurate data.

C. GPS Modules

The system instantly determines the location of the vehicle using the SIM28ML GPS module. This mode uses tracking to accurately determine the vehicle's position in the world. GPS receivers play an important role by displaying data, including real-time data, in NMEA format. Initially, the received data is sent to Arduino and then to the contact of the GSM module. On the other hand, On the other hand, if the sample rate is high, it is possible to miss a moment of crash event. The proposed method is presented in order to solve this problem as following The GPS module operates at 1575.42 MHz and is an important element of search and alert.

D. LCD Modules

The 16x2 alphanumeric LCD module is used to display numbers, letters and special characters. The decision line of the LCD interface is used with the digital pins of the Arduino to ensure good communication. Writing can be done by connecting Arduino-specific pins to the RS and E pins of the LCD. This module is used to display status or coordination throughout the entire operation.

## IX. IMPLEMENTATION

Our system is divided into two different stages: the incident detection phase using a smartphone and the notification phase via the website, which is a solution used in hospitals.

A. Implementation of the Detection Phase:

1. Android Application Development: Develop high-quality Android applications using the Java programming language. The application is designed for the Android operating system and is compatible with minimum API level 17 and target API level 26. User interaction begins with the registration process, where users log in by entering their ID and password. After logging in, the user activates the tracking function and starts collecting and sending information. The app constantly monitors data from smartphone sensors and sends it to the cloud for analysis. If an event is detected, the app triggers an alert that lasts 10 seconds.

2. Follow-up alert level: After the event is identified, the cloud device detects the nearest hospital and sends the event to the nursing home via internet-based software. Built using ASP .NET MVC 4, this interface serves as a pipeline for hospitals to test heavy overlap. In case of an accident, the website carries Twist information, including the Twist domain, driver details and vehicle details. A Microsoft SQL database is used to store event-related information. The site's user interface layout includes HTML, CSS, and Bootstrap and integrates with the Google Maps API to visualize the scene.

## X. RESULTS

The culmination of this project manifests in an application designed to offer assistance to individuals in need, particularly those unable to seek help independently. The application facilitates the automatic transmission of distress signals, complete with precise location data, to emergency services in the event of an accident, ensuring swift and effective support. This achievement is realized through the utilization of cost-effective sensors, underscoring the project's commitment to accessibility and affordability. The proposed algorithm can be used as an integrated collision detection algorithm by integrating tracking information from multiple sources for collision warning, avoidance and mitigation. Throwing new light on existing methods, we hope that the proposed algorithm will complement others and help to reduce overfitting to datasets with little test examples or training as well as contribute to the development of algorithms that work well in the crash By leveraging readily available sensors, the system demonstrates a practical and economical solution to address the critical need for timely assistance. The positive outcomes underscore the project's potential impact on improving overall emergency services and road safety.

## XI. FUTURE ENHANCEMENTS

The envisaged system primarily focuses on accident detection; however, future enhancements could expand its capabilities to include on-site medical assistance for accident victims. Advancements in technology could pave the way for innovative solutions aimed at providing immediate medication and first aid at the accident site, thereby further mitigating the impact of accidents. The performance of the proposed crash detection algorithm was evaluated for two scenarios via offline simulations, including crash of various direction. To show the benefit of the proposed algorithm, driving, parking scenarios were considered. The driving scenario was considered to compare the crash detection between the proposed algorithm and a general black-box available in a market. The test environment was compared after installing the product proposed to the test vehicle and the product used, and the crash was applied in the actual road and parking environment to determine whether the crash was judged.

ADVANCED ALERT SYSTEMS

To proactively address and prevent accidents, future iterations of the system could incorporate advanced alert systems. These systems might utilize cutting-edge technologies to provide real-time warnings to drivers, enabling them to take corrective actions promptly. Potential enhancements may include alert mechanisms capable of automatically stopping vehicles to avert impending accidents, thereby introducing an additional layer of proactive safety measures.

## XII. CONCLUSION

The envisaged automated accident detection system presented in this research holds immense potential as a life-saving intervention for individuals involved in vehicular accidents. The system, designed for user-friendly operation, boasts simplicity that extends accessibility to both technical and non-technical users alike. Comprising hardware and software components, the hardware unit integrates accident detection sensors under the control of an Arduino board, discreetly embedded within the vehicle. Conversely, the software component encompasses an Android application installed on the driver's smartphone, providing detailed map information.

In summary, the proposed system demonstrates notable advantages, including its cost-effectiveness, security features, and ease of use. The fusion of hardware and software components creates a cohesive solution that effectively reduces accident-related casualties. This work stands as a testament to the potential impact of technological interventions in enhancing road safety and emergency response systems. The system's ability to minimize casualties positions it as a valuable contribution to the ongoing efforts to improve overall safety measures in the context of vehicular accidents.

## XIII. REFERENCES

[1]. DR.C.K.Gomathy , V.Geetha , S.Madhumitha , S.Sangeetha , R.Vishnupriya Article: A Secure With Efficient Data Transaction In Cloud Service, Published by International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 5 Issue 4, March 2016, ISSN: 2278 – 1323.

[2]. Dr.C.K.Gomathy,C K Hemalatha, Article: A Study On Employee Safety And Health Management International Research Journal Of Engineering And Technology (Irjet)- Volume: 08 Issue: 04 | Apr 2021

[3]. Dr.C K Gomathy, Article: A Study on the Effect of Digital Literacy and information Management, IAETSD Journal For Advanced Research In Applied Sciences, Volume 7 Issue 3, P.No-51-57, ISSN NO: 2279-543X,Mar/2018

[4]. Dr.C K Gomathy, Article: An Effective Innovation Technology In Enhancing Teaching And Learning Of Knowledge Using Ict Methods, International Journal Of Research Studies in Computer Science and Technology (Ijcrcst) E-Issn: 2395-5325 Volume 3, Issue 1 4,P.No-10-13, April ’2017

[5]. Dr.C K Gomathy, Article: Supply chain-Impact of importance and Technology in Software Release Management, International Journal of Scientific Research in Computer Science Engineering and Information Technology ( IJSRCSEIT ) Volume 3 | Issue 6 | ISSN : 2456-3307, P.No:1-4, July-2018.

[6]. C K Gomathy and V Geetha. Article: A Real Time Analysis of Service based using Mobile Phone Controlled Vehicle using DTMF for Accident Prevention. International Journal of Computer Applications 138(2):11-13, March 2016. Published by Foundation of Computer Science (FCS), NY, USA,ISSN No: 0975-8887

[7]. C K Gomathy and V Geetha. Article: Evaluation on Ethernet based Passive Optical Network Service Enhancement through Splitting of Architecture. International Journal of Computer Applications 138(2):14-17, March 2016. Published by Foundation of Computer Science (FCS), NY, USA, ISSN No: 0975-8887

[8]. C.K.Gomathy and Dr.S.Rajalakshmi.(2014), "A Software Design Pattern for Bank Service Oriented Architecture", International Journal of Advanced Research in Computer Engineering and Technology(IJARCET), Volume 3,Issue IV, April 2014,P.No:1302- 1306, ,ISSN:2278-1323.

[9]. C. K. Gomathy and S. Rajalakshmi, "A software quality metric performance of professional management in service oriented architecture," Second International Conference on Current Trends in Engineering and Technology - ICCTET 2014, 2014, pp. 41-47, doi: 10.1109/ICCTET.2014.6966260.

[10]. Dr.C K Gomathy, V Geetha ,T N V Siddartha, M Sandeep , B Srinivasa Srujay Article: Web Service Composition In A Digitalized Health Care Environment For Effective Communications, Published by International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 5 Issue 4, April 2016, ISSN: 2278 – 1323.

[11]. Dr.C K Gomathy, V Geetha ,T.Jayanthi, M.Bhargavi, P.Sai Haritha Article: A Medical Information Security Using Cryptosystem For Wireless Sensor Networks, International Journal Of Contemporary Research In Computer Science And Technology (Ijcrcst) E-Issn: 2395-5325 Volume3, Issue 4, P.No-1-5,April ’2017

[12]. V Geetha ,Dr.C K Gomathy T.Jayanthi, R. Jayashree,, S. Indhumathi, E. Avinash,, Article: An Efficient Prediction Of Medical Diseases Using Pattern Mining In Data Exploration, International Journal Of Contemporary Research In Computer Science And Technology (Ijcrcst) E-Issn: 2395-5325 Volume3, Issue 4,P.No-18-21,April ’2017

[13]. V Geetha , Dr.C K Gomathy T.Jayanthi, G.Vamsi , N.P.Ganesh, G.Raheshwara Rao, Article: An Effective Implementation Of Data Prefetching To Alleviate The Storage Access Latency, International Journal Of Contemporary Research In Computer Science And Technology (Ijcrcst) E-Issn: 2395-5325 Volume3, Issue 4,P.No-14-17.April ’2017

[14]. "A STUDY ON THE RECENT ADVANCEMENTS IN ONLINE SURVEYING", International Journal of Emerging Technologies and Innovative Research (www.jetir.org), ISSN:2349-5162, Vol.5, Issue 11, page no.327-331, November-2018, Available :http://www.jetir.org/papers/JETIR1811850.pdf