Driver's Driving Pattern Detector

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1. Abstract

The Driver's Driving Pattern Detector represents a pivotal advancement in road safety and traffic management. This research paper offers a comprehensive analysis of its technical components, implementation considerations, and empirical evaluations. The findings underscore the potential for DDPD to significantly reduce road accidents, promote eco-friendly driving habits, and contribute to the development of smarter and safer transportation systems in the future. Furthermore, this research paper evaluates the effectiveness of the DDPD system through extensive simulations and field tests. It assesses the accuracy of the system in detecting and categorizing driving patterns, including aggressive driving, distracted driving, and drowsy driving. Moreover, it measures the impact of DDPD on driver awareness and behavior modification

Keywords: Driver's Driving Pattern, Driver behaviours

2. Introduction

Driver behaviours, driving styles or characteristics need to be recognized and predicted in order to design and develop intelligent and human-centred control systems in transportation. The aim of this study is to identify merge patterns of different drivers and characterize them based on age and gender. It is imperative to analyse the concepts of human driving behaviour and pattern recognition methods as this study discusses possible driving behaviour models based on positions. The idea behind predicting driver behaviour styles is to develop a driving model that takes into account basic driving actions such as rash driving.

3. Literature Review

The following literature surveys provide a useful resource for researchers and practitioners interested driving detection. They cover the latest techniques, challenges, and future directions in this field and can serve as a starting point for further research.

[1] N.Kapoor, et al., "Using mobile phone sensors to detect driving behavior", Proceedings of the 3rd ACM Symposium on Computing for Development , 2013.

This application collects data from accelerometers, GPS and also record sounds with the help of microphone, and then data is combined and analyzed to detect rash driving patterns.

[2] Fazeen M. ,et al., "Safe Driving Using Mobile Phones", IEEE Transactions on Intelligent Transportation Systems, 2012.

They have used the three-axis accelerometer of an Android-based smartphone to record and analyze various driver behaviors and external road conditions that could potentially be hazardous to the health of the driver. They have utilized x-axis and y-axis accelerometer

[3] Chigurupa S.,et al., "Integrated Computing System for measuring Driver Safety Index", International Journal of Emerging Technology and Advanced Engineering,2012

They developed an android application which uses data from accelerometer sensor, GPS sensor and video recording is done with the help of camera to give rating to the driver. Whenever the accelerometer values exceed the safe limits, it would be considered as an event.

[4] Johnson D.A.,et al., "Driving Style Recognition using a smartphone as a sensor platform" ,IEEE 14th International Conference on Intelligent Transportation system, 2011

They collect data from various sensors (accelerometer, gyroscope, magnetometer, GPS, video) and fused related data into a single classifier based on Dynamic Time Warping (DTW) algorithm. Their system is known as MIROAD: A Mobile-Sensor- Platform for Intelligent Recognition of Aggressive Driving, the system can provide audible feedback if a driver's style becomes aggressive as well as the information leading up to an aggressive event

[5] "A survey of driving style analysis" by *Leandro M. Villas, et al., Published in Expert Systems with Applications, 2016.*

This comprehensive survey provides an overview of various techniques for driving style analysis, including data collection methods, feature extraction, and machine learning algorithms for pattern detection.

[6] "Driver behavior analysis in intelligent transportation systems" by Nauman Aslam, et al., Published in IEEE Transactions on Intelligent Transportation Systems, 2018.

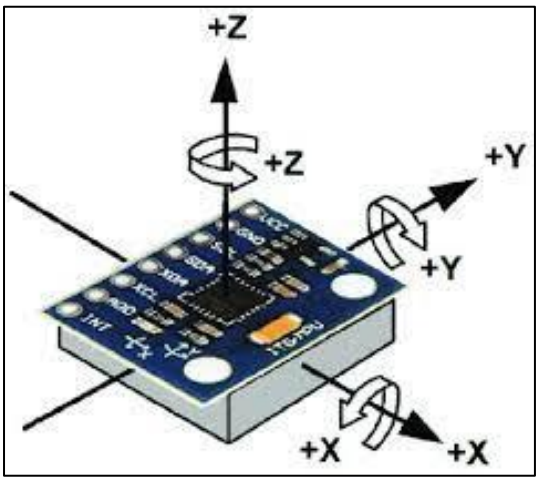
This paper reviews the latest developments in driver behavior analysis, including studies on aggressive driving, drowsy driving, and distracted driving, with a focus on data sources and machine learning techniques.

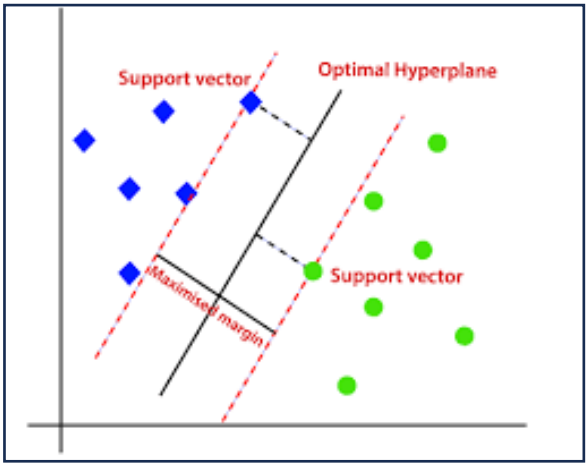
[7] “A survey of smartphone-based sensing in vehicular environments” by Felipe Meneguzzi, et al., Published in Ad Hoc Networks, 2016.
While not solely focused on driving patterns, this survey covers smartphone-based sensors and data collection techniques that are often used in driving behavior analysis applications.
[8] “Machine learning-based driving behavior analysis for in-vehicle driver assistance” by Jingning Zhang, et al., Published in IEEE Transactions on Intelligent Transportation Systems, 2011.
This paper explores the use of machine learning algorithms to analyze driving behavior for in-vehicle driver assistance systems, focusing on features like lane deviation and velocity.
[9] "Driving Style Recognition Using Random Forests" by Kruize, et al. (2017)
This paper presents an approach to driving style recognition using random forests and discusses its effectiveness.
[10] "A Survey on Driving Style Analysis" by Montanari, et al. (2018)
This paper focuses on driving style analysis and discusses the various machine learning algorithms used for classifying driving styles.
[11] "A Review of Driving Style Recognition Systems" by Ayub, et al. (2018)
This review summarizes the state of the art in driving style recognition and discusses challenges and future directions.
[12] "Driver Behavior Profiling: An Investigation via Classification Algorithms and Evaluation Metrics" by Kezunovic, et al. (2019)
This study explores the use of classification algorithms for driver behavior profiling and evaluates their performance using various metrics.
[13] "Driver Behavior Analysis for Safety" by Gao, Shang, and Cao (2017)
This comprehensive survey provides an overview of various approaches to driver behavior analysis, including data sources, feature extraction, and modeling techniques.

4. Methodology

Following Algorithms have been taken into considerations while working on this project;

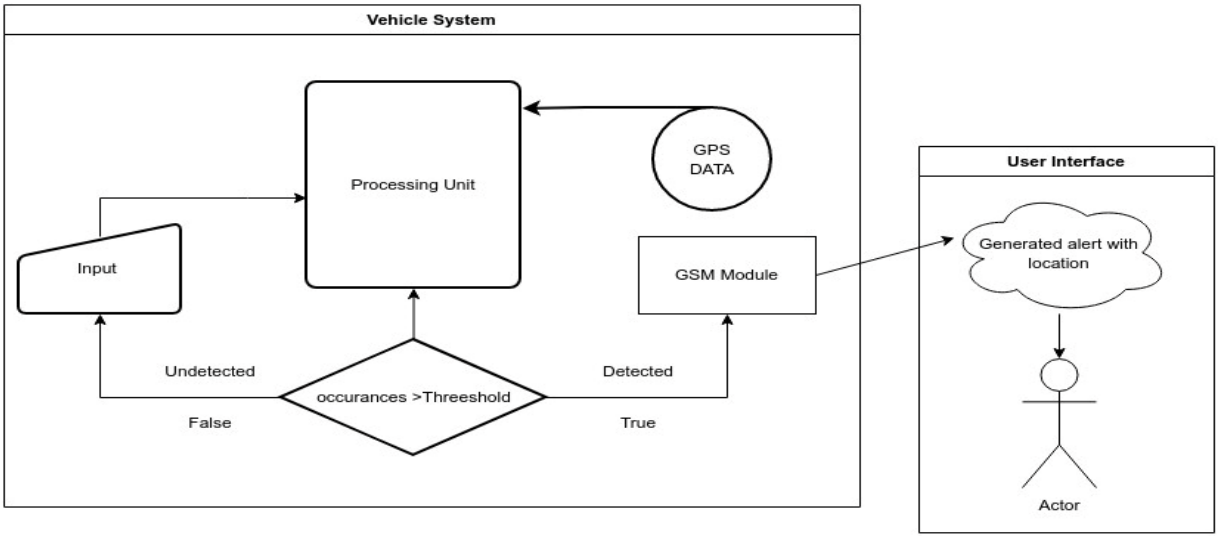
1. Analyzing axial movements with speed Components required are ESP-8266, ADXL 345, GPS NEO-6M, SIM800L V2.0, 5V Wireless GSM.
2. Support Vector Machine (SVM)
   Features with both classification and regression tasks.





5. Approach to study

It can analyze various inputs such as vehicle speed, acceleration, steering behavior, and other driving-related data to accurately detect and classify a driver's driving pattern.
This could include identifying aggressive driving, distracted driving, smooth driving and other driving behaviors.
By leveraging machine learning algorithms, the project aims to enhance driver safety, provide insights into driving behavior, and potentially contribute to the development of driver assistance systems or driver monitoring technologies.



6. References

Here is a list of references and types of sources you can consider:

1. Academic Journals:
   1.1. Coughlin, J. F., & D'Ambrosio, L. A. (2017). "Use of In-Vehicle Technologies by Older Adults." In Handbook of Driving Simulation for Engineering, Medicine, and Psychology (pp. 183-194). CRC Press.
   1.2. Koopman, P., & Wagner, M. (2017). "Challenges in Automated Driving." Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 375(2107), 20150381.
2. Conference Papers:
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   2.2. Li, Y., & Li, K. (2018). "A Deep Learning-Based Real-Time Driving Behavior Recognition System." In Proceedings of the IEEE International Conference on Robotics and Automation (ICRA).
3. Books:
   3.1. "Advanced Driver Assistance Systems: Principles, Challenges, and Future Directions" by Jan F. C. Glatz, Lutz Eckstein, and Jochen Wiedemann.
   3.2. "Machine Learning for Intelligent Vehicles and Smart Transportation" by Ljubo Vlacic and Damian H. Mannion.
4. Government Reports and Guidelines:
   4.1. National Highway Traffic Safety Administration (NHTSA). (2016). "Automated Driving Systems: A Vision for Safety."
5. Technical Reports and Whitepapers:
   5.1. SAE International. (2018). "J3016: Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles."