Literature survey

1.TITLE: Vehicle Acceleration Prediction Based on Machine Learning Models and Driving Behavior Analysis

AUTHOR: Yajie Zou , Lusa Ding , Hao Zhang , Ting Zhu and Lingtao Wu

YEAR:2022

PAPER EXPLANATION

Driving behavior is one of the most critical factors in traffic accidents. Accurate vehicle acceleration prediction approaches can promote the development of Advanced Driving Assistance Systems (ADAS) and improve traffic safety. However, few prediction models consider the characteristics of individual drivers, which may overlook the potential heterogeneity of driving behavior. In this study, a vehicle acceleration prediction model based on machine learning methods and driving behavior analysis is proposed. First, the driving behavior data are preprocessed, and the relative distance, relative speed, and acceleration of the subject vehicle are selected as feature variables to describe the driving behavior. Then, a finite Mixture of Hidden Markov Model (MHMM) is used to divide the driving behavior semantics. The model can divide heterogeneous data into different behavioral semantic fragments within different time lengths. Next, the similarity of different behavioral semantic fragments is evaluated using the Kolmogorov–Smirnov test. In total, 10 homogenous drivers are classified as the first group, and the remaining 20 drivers are classified as the second group. Long Short-Term Memory (LSTM) and GateRecurrentUnit(GRU) are used to predict thevehicle acceleration for both groups. The prediction results show that the proposed method in this study can significantly improve the prediction accuracy of vehicle acceleration.

2.TITLE : A systematic literature review of vehicle speed assistance in intelligent transportation system

AUTHOR: Mehrdad Asadi, Mahmood fathy, Hamidrreza Mahini, Amir masoud Rahmani

YEAR:2021

PAPER EXPLANATION

Due to the emergence of new technologies over the past decade, vehicle speed assistance systems in intelligent transportation systems have frequently been discussed. Up to now, a systematic literature review has not been presented to discover and evaluate the different vehicle speed assistance approaches for on-road vehicles in intelligent transportation systems. To overcome this issue, this research identified peer-reviewed articles published in the most well-known libraries from 2011 to 2020. 79 primary studies were then projected and a systematic analysis of the selected literature was conducted. The findings show different driving goals, namely eco-driving, safety, comfort, travel time improvement as well as the high-level objectives addressed by vehicle speed assistance systems. The analytical discussions are provided to show different perspectives, properties and limitations of the existing solutions. This analysis allows to provide future challenges and directions in this field of research.

3.TITLE : Machine learning methods for vehicle predictive maintenance using off-board and on-board data

AUTHOR: Rune Prytz

YEAR:2021

PAPER EXPLANATION

Vehicle uptime is getting increasingly important as the transport solutions become more complex and the transport industry seeks new ways of being competitive. Traditional Fleet Management Systems are gradually extended with new features to improve reliability, such as better maintenance planning. Typical diagnostic and predictive maintenance methods require extensive experimentation and modelling during development.

This is unfeasible if the complete vehicle is addressed as it would require too much engineering resources. This thesis investigates unsupervised and supervised methods for predicting vehicle maintenance. The methods are data driven and use extensive amounts of data, either streamed, on-board data or historic and aggregated data from off-board databases. The methods rely on a telematics gateway that enables vehicles to communicate with a back-office system. Data representations, either aggregations or models, are sent wirelessly to an off-board system which analyses the data for deviations. These are later associated to the repair history and form a knowledge base that can be used to predict upcoming failures on other vehicles that show the same deviations.

The thesis further investigates different ways of doing data representations and deviation detection. The first one presented, COSMO, is an unsupervised and self-organised approach demonstrated on a fleet of city buses. It automatically comes up with the most interesting on-board data representations and uses a consensus based approach to isolate the deviating vehicle. The second approach outlined is a supervised classification based on earlier collected and aggregated vehicle statistics in which the repair history is used to label the usage statistics. A classifier is trained to learn patterns in the usage data that precede specific repairs and thus can be used to predict vehicle maintenance. This method is demonstrated for failures of the vehicle air compressor and based on AB Volvo's database of vehicle usage statistics.

4.TITLE: A Novel performance model based on machine learning

AUTHOR: Andrei Aksjonov Pavel Nedoma Valery Vodovozov Eduard Petlenkov PartinHerrmann

YEAR:2019

PAPER EXPLANATION

Models of road vehicle driver behaviour are widely used in several disciplines, like driver distraction and autonomous driving In this paper a novel driver performance model, which is unique for every driver is introduced. The driver is modelled with machine learning algorithms, namely artificial neural network and adaptive neuro- fuzzy inference system. Every model is trained and validated with the data collected during the real-time driver-in-loop experiment on a vechicle simulator for each driver separately . In total 18 participants contributed to the experiment . Although the predication accuracy of the models depends on the algorithm specifications , the artificial neural network was slightly more accurate in driver performance predication comparing to the adaptive neuro- fuzzy inference system . The driver models may be used in detection of driver distraction induced by in vehicle information system.

5.TITLE: Vehicle Detection And Tracking Using Machine Learning Technique

AUTHOR: Sipan Masoud Mustafa

YEAR: 2019

PAPER EXPLANATION

This master's thesis focuses on vehicle detection and tracking. The research tries to detect vehicles in images and videos. It deploys a dataset from Udacity in order to train the algorithms. Two machine learning algorithms; Support Vector Machine (SVM) and Decision Tree have been developed for the detection and tracking tasks. Python programming language have been utilized as the development language for the creation and training of both models. These two algorithms have been developed, trained, tested, and compared to each other to specify the weaknesses and strengths of each of them, although to present and suggest the best model among these two. For the evaluation purpose multiple techniques are used in order to compare and identify the more accurate model. The primary goal and target of the thesis is to develop a system in which the system should be able to detect and track the vehicles automatically whether they are static or moving in images and videos.Vehicle detection also called computer vision object recognition, basically the scientific methods and ways of how machines see rather than human eyes. The main duty of a vehicle detection system is to localize one or more vehicles in input images. The results showed that SVM outperformed the Decision Tree and has acceptable accuracy for the vehicle detection and tracking tasks.

6.TITLE: Machine Learning Based Real-Time Vehicle Data Analysis for Safe Driving Modeling

AUTHOR: Singh Pamul Yadav ,Sangsu Jung ,Dhananjay

YEAR:2019

PAPER EXPLANATION

This paper identifies a necessity to evaluate the Meta features of vehicles which could be helpful in improving the vehicle driver's skill to prevent accidents and also evaluate the change in the quality of cars over passing time. This paper does an analysis of the vehicle data using supervised learning based linear regression model that is used as an estimator for Driver's Safety Metrics and Economic Driving Metrics. The data collected was obtained from fifteen different drivers over a span of one month which accumulated over 15000 data points. And the metrics that we have devised have potential application in automotive technology analysis for developing an advanced intelligent vehicles. Also, we have presented a system for performing the real-time experiment based on the On-Board-Diagnosis version II (OBD-II) scanner data. Finally, we have analyzed and presented the parameter accuracy over 80% for the driver's safety solution in real-world scenario.

7.TITLE : Research Progress and Prospects of Vehicle Driving Behavior Prediction

AUTHOR: Xinghua Hu and Mintanyu Zheng

YEAR:2021

PAPER EXPLANATION

Autonomous driving technology is vital for intelligent transportation systems. Vehicle driving behavior prediction is the foundation and core of autonomous driving. A detailed review of the existing research on vehicle driving behavior prediction can improve the understanding of the current progress of research on autonomous driving and provide references for follow-up researchers. This paper primarily reviews and analyzes the control models of autonomous driving, prejudgment methods, on-road and intersection traffic decision-making, and shortcomings of the research about the prediction of individual intelligent vehicle driving behavior, the prediction on movements of vehicles connected via the Internet, and prediction of driving behavior in a mixed traffic environment. The deficiencies in the research on vehicle driving behavior prediction are as follows: (1) there are numerous limitations in the intelligent application scenarios of individual intelligent vehicles; (2) although the Internet of Vehicles is a significant developmental trend, the training and test datasets are not rich enough; and (3) as the research of mixed traffic flow is still in the initial stages, the comfort brought by autonomous driving in hybrid driving environments is not being considered. In addition to the above analyses and comments, the future research prospects of vehicle driving behavior prediction are discussed as well.

8.TITLE : Driving Behaviour Analysis Using Machine and Deep Learning Methods for Continuous Streams of Vehicular Data

AUTHOR: Nikolaos Peppes , Theodoros Alexakis , Evgenia Adamopoulou and Konstantinos Demestichas

YEAR:2021

PAPER EXPLANATION

In the last few decades, vehicles are equipped with a plethora of sensors which can provide useful measurements and diagnostics for both the vehicle's condition as well as the driver's behaviour. Furthermore, the rapid increase for transportation needs of people and goods together with the evolution of Information and Communication Technologies (ICT) push the transportation domain towards a new more intelligent and efficient era. The reduction of CO2 emissions and the minimization of the environmental footprint is, undeniably, of utmost importance for the protection of the environment. In this light, it is widely acceptable that the driving behaviour is directly associated with the vehicle's fuel consumption and gas emissions. Thus, given the fact that, nowadays, vehicles are equipped with sensors that can collect a variety of data, such as speed, acceleration, fuel consumption, direction, etc. is more feasible than ever to put forward solutions which aim not only to monitor but also improve the drivers' behaviour from an environmental point of view. The approach presented in this paper describes a holistic integrated platform which combines well-known machine and deep learning algorithms together with open-source-based tools in order to gather, store, process, analyze and correlate different data flows originating from vehicles. Particularly, data streamed from different vehicles are processed and analyzed with the utilization of clustering techniques in order to classify the driver's behaviour as eco-friendly or not, followed by a comparative analysis of supervised machine and deep learning algorithms in the given labelled dataset.

9.TITLE : Vehicle Response Prediction Using Physical And Machine Learning Models

AUTHOR: Rune Prytz

YEAR:2021

PAPER EXPLANATION

With sporadic advancement in computer technology, transportation is moving towards autonomy. With rapid increase in production of highly automated vehicles (AVs), validation and safety of AVs is gaining high importance. The estimation of safety for AVs is a challenging problem as the AVs mimic human drivers and it requires an estimate of AVs response at all critical scenarios. AV response in each scenario, if known, can be used for estimating its safety. In this work, methods for estimating vehicle response are proposed by using various models based on both physics-based modeling as well as Machine Learning algorithms. Various Machine Learning algorithms were explored for classifying and predicting driver's intention, such as Extremely Randomized Trees and Gaussian Mixture Model based Hidden Markov Model. Also, physics-based modeling is done for longitudinal carfollowing conditions using three models namely: Spring-Damper model, Time-toCollision model and Gazis-Herman-Rothery model. The Machine Learning models were fitted using Naturalistic Driving Study dataset (NDS) collected as a part of Strategic Highway Research Program-2 (SHRP2). The vehicular data comprising of various vehicular parameters is processed and analyzed for preparing driver's behavior model, which gives an estimate of vehicle's longitudinal and lateral acceleration at that given instance. Physics-based models were limited to longitudinal acceleration prediction as lateral acceleration prediction in dynamic traffic conditions is a iii highly complex problem for modeling. The physics-based models were fitted using both SHRP2 as well as the test track data of AVs collected from Transportation Research Center Inc. Then, the fitted Machine Learning and physics-based models were validated against validation data. The parameters obtained from physics-based models were used for obtaining driving characteristics, which were used to compare tested AVs among themselves as well as human drivers

10.TITLE : Vehicle Tracking And Speed Estimation System

AUTHOR: Chan Chia Yik

YEAR:2017

PAPER EXPLANATION

This project is intends to develop a vehicle tracking and speed estimation using digital image processing technique. Therefore this project needs a video input to make the system work. The system is designed to track the vehicle position and calculate its moving speed. The method that uses to estimate the speed of the moving vehicle currently is RADAR (Radio Detection and Ranging). But this method requires high end equipment, which means the cost for this method is high. Therefore an alternative way is needed. This proposed method is using the image processing technique. This system consists of 4 major steps: 1) image acquisition 2) image background subtraction 3) location detection 4) speed estimation. The rate of accuracy for this system is expected to have 99%