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A DRIVING DECISION STRATEGY BY SOFT VOTING CLASSIFICATION USING MACHINE LEARNING

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ABSTRACT

In this paper we propose a new strategy i.e., A Driving Decision Strategy (DDS) which is Analysis of both external and internal factors determines the optimal strategy for an autonomous vehicle (consumable conditions, RPM levels etc.). To implement this, DDS (Driving Decision Strategy) algorithm is introduced which is based on genetic algorithm. DDS algorithm obtained input from sensor and then passes in this project we compare with existing machine learning algorithm such as Random Forest and MLP (Multilayer Perceptron Algorithm.) and then we use the soft voting classification. Soft voting entails combining the probabilities of each prediction in each model and picking the prediction with the highest total probability.

KEYWORDS: Multilayer Perceptron, Random Forest, Soft Voting Classifier, Tkinter, Pandas, Numpy.

INTRODUCTION

Global companies are developing technologies for advanced self-driving cars, which is in the 4th stage. Self driving cars are being developed based on various ICT technologies, and the principle of operation can be classified into three levels of recognition, judgment and control. The recognition step is to recognize and collect information about surrounding situations by utilizing various sensors in vehicles such as GPS, camera, and radar. The judgment step determines the driving strategy based on the recognized information. Then, this step identifies and analyzes the conditions in which the vehicle is placed, and determines the driving plans appropriate to the driving environment and the objectives. However, as the performance of self-driving cars improves, the number of sensors to recognize data is increasing. An increase in these sensors can cause the in- vehicle overload. Self-driving cars use in-vehicle computers to compute data collected by sensors. As the amount of the computed data increases, it can affect the speed of judgment and control because of overload. These problems can threaten the stability of the vehicle. To prevent the overload, some studies have developed hardware that can perform deep- running operations inside the vehicle, while others use the cloud to compute the vehicle's sensor data. On the other hand, collected from vehicles to determine how the vehicle is driving. This paper proposes a Driving Decision Strategy(DDS) which reduces the in-vehicle computation by generating big data on vehicle driving within the cloud and determines an optimal driving strategy by taking into account the historical data in the cloud.

Objective

The objective of this project is to develop a soft voting classification strategy using machine learning for driving decision-making. This strategy should be able to accurately assess the accuracy of different classifiers, and use a combination of the classifiers' results to make a final prediction with improved accuracy. The project should also include methods for measuring the performance of the strategy and techniques for optimizing the parameters of the classifiers used.

LITERATURE SURVEY

Yukiko Kenmochi, Lilian Buzer, Akihiro Sugimoto, Ikuko Shimizu, [1] (2008) used a method for segmenting a 3D point cloud into planar surfaces using recently obtained discrete-geometry results. In contrast to the continuous case, there exist a finite number of local geometric patterns (LGPs) appearing on discrete planes. Moreover, such an LGP does not possess the unique normal vector but a set of normal vectors. By using those LGP properties, we first reject non- linear points from a point cloud, and then classify non-rejected points whose LGPs have common normal vectors into a planar-surface-point set. From each segmented point set, we also estimate the values of parameters of a discrete plane by minimizing its thickness.

Ning Ye, Yingya Zhang, Ruchuan Wang, Reza Malekian, [2] (2017) In Intelligent Transportation Systems (ITS), logistics distribution and mobile e-commerce, the real-time, accurate and reliable vehicle trajectory prediction has significant application value. Vehicle trajectory prediction can not only provide accurate location-based services, but also can monitor and predict traffic situation in advance, and then further recommend the optimal route for users. In this paper, firstly, we mine the double layers of hidden states of vehicle historical trajectories, and then determine the parameters of HMM (hidden Markov model) by historical data. Secondly, we adopt Viterbi algorithm to seek the double layers hidden states sequences corresponding to the just driven trajectory. Finally, we propose a new algorithm (DHMTP) for vehicle trajectory prediction based on the hidden Markov model of double layers hidden states, and predict the nearest neighbour unit of location information of the next k stages. The experimental results demonstrate that the prediction accuracy of the proposed algorithm is increased by 18.3% compared with TPMO algorithm and increased by 23.1% compared with Naive algorithm in aspect of predicting the next k phases' trajectories, especially when traffic flow is greater, such as this time from weekday morning to evening. Moreover, the time performance of DHMTP algorithm is also clearly improved compared with TPMO algorithm.

Y.N. Jeong, S.R.Son, E.H. Jeong and B.K. Lee, [3] (2018) The first In-Vehicle Gateway Module (In-VGM) collects the data from the in-vehicle sensors, consisting of media data like a black box, driving radar, and the control messages of the vehicle, and transfers each of the data collected through each Controller Area Network (CAN), FlexRay, and Media Oriented Systems Transport (MOST) protocols to the on-board diagnostics (OBD) or the actuators. The data collected from the in-vehicle sensors is transferred to the CAN or FlexRay protocol and the media data collected while driving is transferred to the MOST protocol.

EXISTING SYSTEM

K-NN, SVM are existing methods Although studies have been done in the medical field with an advanced data exploration using machine learning algorithms, orthopedic disease prediction is still a relatively new area and must be explored further for the accurate prevention and cure. It mines the double layers of hidden states of vehicle historical trajectories, and then selects the parameters of Hidden Markov Model (HMM) by the historical data. In addition, it uses a Viterbi algorithm to find the double layers hidden states sequences corresponding to the just driven trajectory. Finally, it proposes a new algorithm for vehicle trajectory prediction based on the hidden Markov model of double layers hidden states, and predicts the nearest neighbor unit of location information of the next k stages.

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Drawbacks

Less efficiency and need more are explored for prevention.

PROPOSED SYSTEM

We proposed a feature selection with MLP and RF algorithm and soft voting approach to compute the sensor data to determine the optical driving strategy of an autonomous vehicle. And here in this project we implement the hybrid classification using soft voting classifier. In classification problems, there are two types of voting: hard voting and soft voting. Hard voting entails picking the prediction with the highest number of votes, whereas soft voting entails combining the probabilities of each prediction in each model and picking the prediction with the highest total probability. The Proposed design and framework for predicting driving strategy can be done as shown figure-1.

Figure-1: Proposed framework for A Driving Decision Strategy (DDS) based on Machine learning using Soft Voting Classification.

Advantages

These improvements system to control the vehicle based on sensor data.

ALGORITHMS

Random Forest (RF)

Random Forest works in two-phase first is to create the random forest by combining N decision tree, and second is to make predictions for each tree created in the first phase. Random forest is a type of supervised machine learning algorithm used for classification and regression. The predictions from each tree are combined to generate a single, more accurate prediction. It has the ability to handle a large number of variables, including both discrete and continuous variables.

Multilayer Perceptron (MLP)

A multilayer perceptron (MLP) is a class of feed forward artificial neural network (ANN). The term MLP is used ambiguously, sometimes loosely to any feed forward ANN, sometimes strictly to refer to networks composed of multiple layers of perceptrons. Multilayer perceptrons are sometimes colloquially referred to as "vanilla" neural networks, especially when they have a single hidden layer. [1] An MLP consists of at least three layers of nodes: an input layer, a hidden layer and an output layer.

Soft Voting Classifier

Soft voting is a machine learning technique that uses a combination of different algorithms to make a more accurate prediction. In soft voting, each algorithm is trained on the same data and given a weighted vote. The final result is calculated by taking the mean of the weighted votes. This technique is often used for classification problems, where the aim is to predict the class of an input. For example, in a self-driving car decision-making problem, soft voting could be used to combine the predictions of several different algorithms to make a more accurate prediction of the best route to take. The weights of each algorithm could be adjusted to give more importance to certain algorithms, depending on their accuracy or the type of data they are trained on.

RESULTS ANALYSIS

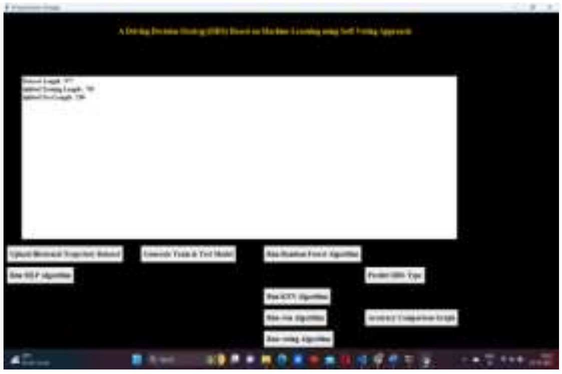

Figure-2: Uploading the trajectory dataset and train and test model to the dataset.

Figure-3: Run the Multilayer Perceptron(MLP) algorithm for the trained trajectory dataset.

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Figure-4: Run the DDS with genetic algorithm using Soft voting classifier for the trajectory dataset.

Figure-5: Run the Random Forest algorithm for the trained trajectory dataset.

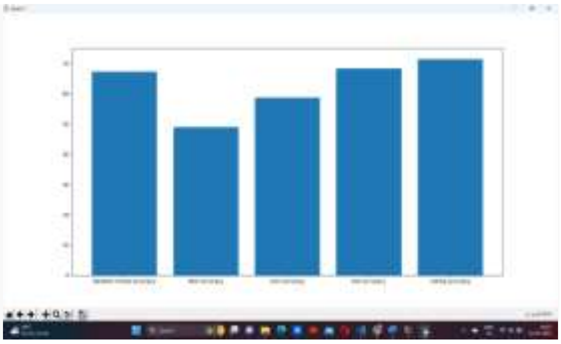

Figure-6: We can conclude that DDS using Soft voting classifier performing well compare to other algorithms.

CONCLUSION

In this project we proposed a Driving Decision Strategy. It executes the genetic algorithm based on accumulated data to determine the vehicle's optimal driving strategy according to the slope and curvature of the road in which the vehicle is driving and visualizes the driving and consumables conditions of an autonomous vehicle to provide drivers. The soft voting technique is an effective way of driving decision strategies using machine learning. It allows for a consensus of experts to be reached in a single vote, and it also allows for the inclusion of multiple models in the decision making process. By allowing for multiple models to contribute to the decision process, it helps to reduce the chances of bias and promote better decision making. The Driving Decision Strategy has the similar accuracy to MLP which it determines optimal driving strategy 45% faster than to it, and the DDS has higher accuracy of 26% than RF, and the DDS which determines SVM 33% faster than it, and the DDS which has higher accuracy of 24% than KNN. And also determines the optimal driving strategy 25% faster than it. Thus, the DDS is best suited for determining the optimal driving strategy that requires accuracy and real-time.

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