Research on Machine Learning Method for Intelligent Driving

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Abstract: Machine learning technology is widely used in intelligent driving of vehicles. Intelligent driving based on machine learning is one of the directions and difficulties in the development of intelligent vehicles. Firstly, this paper analyses the related concepts of machine learning. Then this paper analyses the research of machine learning under intelligent driving. Finally, this paper analyses the research of machine learning algorithm.

1. Introduction

At present, artificial intelligence and machine learning technology are widely used in all walks of life, especially in the automobile field. Intelligent driving technology presents the situation of blowout in an all-round way. The result will have a far-reaching impact on the whole transportation industry and even human society. Modern automobiles are equipped with professional sensors and electronic control units to improve the safety level of the whole vehicle, such as ABS, EPS, ADAS cruise control, lane maintenance, and cross-wind assistance. With the improvement of vision, radar and map technology, modern vehicles have gradually acquired the ability to understand road scenes. Combined with the data acquisition inside the vehicle, we can have a more comprehensive view of the inside and outside. If the controller can effectively process the internal and external data, it is of great significance that we can realize the automatic driving of vehicles by calculating the safe driving strategy in real time.

2. Research on machine learning for intelligent driving

2.1 Definition of machine learning

Machine learning is a subject about how to use computer programs to simulate human learning activities. In the real world, many problems can not be solved by direct programming, especially automatic driving. It is hoped that computer programs can improve their performance through experiential learning just like human beings. According to Herbert A. Simon, the master of artificial intelligence, learning is the enhancement or improvement of the system's ability in repeated work. Machine learning systems perform the same or similar tasks better or more efficiently than they do now. Under the influence of experience, human behavior has changed. We call this phenomenon learning. Experience is an important factor in learning, and the results of learning lead to changes in behavior. The main body of machine learning is computer program, so its definition is slightly different. So far, there is no unified, accepted and accurate definition of machine learning. One of the widely used definitions is given by Tom Mitchell of Carnegie Mellon University in his book Machine Learning. Machine learning is a computer program that uses experience to improve the white body performance of the system. The model of machine learning can be shown in Figure 1.
2.2 Intelligent driving on machine learning

Intelligent vehicles are also called driverless vehicles. It is a comprehensive intelligent system which integrates many functions such as environmental perception and recognition, dynamic planning and decision-making, behavior control and execution. It covers many disciplines such as machinery, electronics, artificial intelligence, sensor technology, signal processing, automatic control and computer technology. Intelligent vehicles mainly acquire knowledge from the surrounding road traffic environment through sensors. The collected data are expressed by computer system, and then the driving condition of vehicles is intelligently controlled. Intelligent driving behavior analysis has always been a key and difficult problem in intelligent vehicle research. In the face of complex and dynamic unknown environment such as expressway and urban road, vehicle can not acquire and express multi-source information accurately and in real time, which often leads to wrong behavior decision-making and artificial interference in driving process. Compared with real drivers, artificial intelligence has limited information processing ability in road traffic environment. Many researchers and scholars have done a lot of research on intelligent driving behavior based on machine learning. They expect to ensure the fluency of intelligent driving through machine learning.

3. Research on machine learning algorithms

3.1 Machine learning target recognition

Machine learning mainly generates recognition model by combining training set and test set with a certain algorithm. By combining and improving the accuracy, speed, robustness, scale and explanatory characteristics of model recognition, we can achieve the purpose of practical application. For target recognition research, machine learning is also called pattern recognition technology. Machine learning technology involves probability theory, statistics, convex analysis, algorithm complexity theory and other disciplines. In the field of image, machine learning explores and develops a series of algorithms. These algorithms allow the computer to learn and model itself through data without explicit external instructions. Through the built model and new input, the intelligent vehicle can be predicted. In empirical learning, machine learning can improve the performance of specific algorithms to achieve the purpose of training. It is widely used in image recognition, natural language processing and speech recognition. The flow chart of machine learning algorithm recognition target is shown in Figure 2.

![Figure 2: The flow chart of machine learning algorithm recognition target](image-url)
3.2 Process of intelligent driving algorithms
In this paper, the flow chart of intelligent driving algorithm based on machine learning is shown in Figure 3, which describes the whole control process from start to stop.

3.3 Modeling and prediction of driving behavior based on machine learning
The modeling and prediction of driving behavior are as follows. For some dangerous, abnormal driving behavior and emergency obstacle avoidance behavior, the prediction of these behaviors can effectively reduce the probability of accidents and provide help for intelligent driving and decision-making of vehicles. In 2005, Tsironis Louka used decision tree method to model abnormal driving behavior, and evaluated the accuracy of the model prediction. Kumagai. T uses Bayesian network and joint tree algorithm to improve the accuracy of driving behavior prediction.

In recent years, Jinxian Weng used decision tree classification regression tree (CART) algorithm to analyze the relationship between dangerous driving behavior and its influencing factors. This greatly improves the prediction accuracy of the model. Finally, he solved the problems of the conventional regression model. Prakash, A. K. constructed a driver model based on artificial neural network. Compared with the traditional PID model, it can better predict and control driving behavior in the process of car-following acceleration.

4. Conclusions
Machine learning for driving behavior has always been a bottleneck in the field of intelligent vehicles. On the one hand, machine learning limits the development of intelligent vehicle. On the other hand, we need to find new learning algorithms to deal with the complexity and particularity of driving behavior. We need to improve the learning accuracy of driving behavior through a variety of ways, such as integrated learning methods, expanding learning scale, and strengthening learning. By building a more reasonable driving behavior model, we can promote the new development of driving behavior in the field of machine learning.

![Figure 3: The flow chart of intelligent driving algorithm based on machine learning](image-url)
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