Research on Auto-driving Based on Intelligent Computing

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Abstract: The research on automobile driving has been the focus of attention in foreign countries for decades. Starting from the functional requirements of the autopilot system, this paper proposes a control algorithm based on Intelligent Algorithm for vehicle automatic driving system. In this context, because the automatic driving system has the functions of improving the efficiency of rail transit operation, speeding up the operation speed of vehicles and ensuring the safety of driving, it is very important to develop highly effective intelligent automatic driving system. Aiming at the problem of vehicle tracking control in the process of intelligent vehicle automatic driving, the paper uses the interactive multi-model algorithm to target the guided vehicles with multiple motion states, so as to provide accurate and reliable guidance of vehicle motion state information for intelligent vehicles. The research shows that the method can ensure the accuracy of the road condition calculation and vehicle tracking of the intelligent car, and it has good robustness. Improving the safety of driverless cars is of great significance for traffic safety. It is important to propose corresponding intelligent algorithm for driverless cars for their safety improvement.

1. Introduction

In recent decades, the research on automobile driving has been a hot topic in foreign countries, but it has just started in our country [1]. As one of the core contents of automobile driving. The operation of automobile is controlled by intelligent control system. The driver's task is only to provide necessary information, supervise the running state of automobile and participate in automobile control in case of system failure or emergency. Or set new targets for intelligent control systems [2]. In order to construct such a system, the driver is responsible for the business of controlling the operation of the car. Intelligent vehicles can combine information between two-dimensional images and lidar data to obtain more accurate road environment information. The practical application of key technologies such as path planning and behavior decision-making also improves the reliability and control accuracy of the vehicle [3]. The automatic driving of the car infers the trailing vehicle following model of the route and the arbitrary vehicle speed by receiving the driving information of the vehicle in front of the queue, and adopts an intelligent algorithm to complete the following driving, thereby realizing automatic driving [4].

The automatic driving vehicle is gradually on the stage of history. Compared with manual driving, automatic driving has the characteristics of agility, reliability and high efficiency. Auto-driving breaks through the restrictions of drivers and helps to reduce traffic accidents, alleviate traffic congestion and reduce energy consumption [5]. The opening and closing degrees of throttle pedal and brake pedal are determined according to the distance and speed between the front car and the vehicle. Ideally, the vehicle can drive accurately on the desired path generated by preview, so that the intelligent vehicle can achieve automatic driving [6]. Vehicle queue motion control is regarded as a whole system, starting from all possible parking places to the next parking place according to line data and operation data [7]. The automatic driving is completed according to the line information, the running information, the target speed or the target distance, and the speed adjustment is realized. The intelligent control optimal control method ensures the stability of the fleet tracking in the adaptive control process. Some intelligent control methods are also applied to vehicle motion control for nonlinear factors such as time delay and saturation in the vehicle powertrain model [8].

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2. Materials and Methods

The automatic driving system controls the executive devices of the intelligent vehicle through some intelligent algorithm, so that the driving state of the unmanned vehicle meets specific requirements. Important feedback, vehicle attitude feedback and vehicle speed feedback are added to make the system achieve control objectives better. The task assignment, path planning, load planning, data link planning, including frequency planning, are called distributed mission planning. The design of the controller needs to fully consider the instability and dispersion of environmental variables. On the basis of generating the optimal target curve, the vehicle controller is designed to drive the car according to the optimal target curve to achieve the optimal control effect.

The principle of vehicle optimal operation is mainly to shorten the running time of the station as much as possible, reduce energy consumption, improve ride comfort, improve parking accuracy, safe and punctual operation and so on. The working process of intelligent computing can be simply described as first fuzzifying information, then obtaining intelligent computing output through fuzzy reasoning rules, and then accurately calculating the final output control value by using fuzzy instructions. Intelligent computing does not require an accurate mathematical model, so it is an effective way to solve uncertain system control. In addition, in order to meet the steering stability control requirements in the automatic driving process, the driving torque distribution ratio is controlled based on the active differential principle, and the active yaw moment required for the steering stability control is generated, and under the action of the above control variables, The simulation test response characteristics of the vehicle dynamics model are obtained.

The automatic driving system is essentially a vehicle controller that controls the actuators of vehicles and completes driving behavior without drivers. Because the driverless intelligent vehicle is a highly non-linear multi-rigid-body system. The agents in each UAV system are connected with each other through local communication network, and the whole control of the system is completed through message-passing negotiation, and the global control function is completed through the coordination between the UAVs. The intelligence in each unmanned vehicle is connected to each other through a local communication network, and the overall control of the system is completed through negotiation of message delivery, and the global system control function is completed through coordination between the unmanned vehicles. A schematic diagram of the road model trajectory is shown in Figure 1.

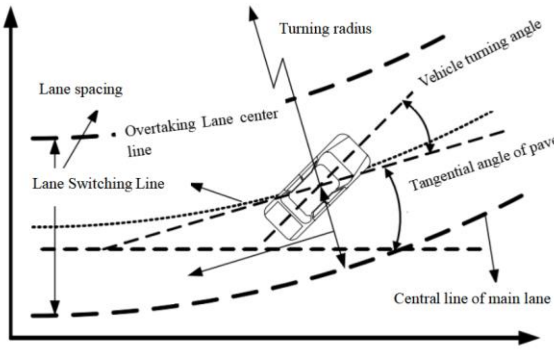

Fig.1. Trajectory sketch of road model

3. Result Analysis and Discussion

In the driving of driverless vehicles, the relative distance, relative speed, relative acceleration and other information of nearby vehicles are mainly considered, while the influence of distant vehicles is less. Because each driverless vehicle has obvious mobility, dispersion and uncertainty. This method can simply and intuitively observe the driving state of the vehicle and record the experimental data in real time. It is convenient to study the control effect of the system. At the same time, the cycle of system development is shortened and the cost of experiment is saved. The effect of relative differential braking on the control of intelligent vehicle motion is relatively small. By the same token, when the left clutch of the active differential is fully engaged, the yaw moment acting on the left and right side halves is reversed, and the total driving torque is the same as when the right clutch is engaged.

Intelligent simulation is a dynamic and vivid imitation of the structure, function and behavior of the system and the thinking process and behavior of the people who participate in the system control. It is a descriptive technique and a quantitative analysis method. Summarizing people's control behavior follows the idea of feedback and feedback control. Manual control decision-making can be described by language and summarized into a series of conditional statements, namely control rules. The feedback compensation system uses the intelligent calculation method to compensate and control the throttle opening and brake hydraulic pressure of the vehicle. Enables the controlled vehicle to quickly track changes in the desired acceleration, thereby eliminating transient errors during motion control. The unmanned vehicle intelligent controller uses independent threads to collect the steering angle, calculates the steering angle error and the steering angle error change rate, performs fuzzy reasoning, and controls the unmanned vehicle intelligent steering wheel to turn.

Vehicle motion control system can track expected acceleration by adjusting valve opening or braking hydraulic pressure. However, if both throttle opening and braking hydraulic signals are applied to the controlled vehicle, system oscillation and performance conflict may occur. Unmanned cars are speeding up; smart cars are slowing down when the meter brake pedal is trampled down. So we want to get the ideal acceleration. That is, each car only accepts the information of the neighboring car, and can adjust its own state of motion according to the received information, then the multiple self-driving car models can be simplified into a multi-agent model, in which each car is an agent. . The control methods of excellent drivers are derived from long-term experience accumulation and continuous improvement of the control process. From this point of view, learning control is to complete the driver's learning process automatically through the computer to achieve the optimal control effect.

4. Conclusion

In this paper, the automobile driving based on intelligent computing is studied. Auto-driving no longer relies on the intelligence of a single car, but considers the car queue as a whole, and then decomposes the complex problem of auto-driving into some small problems for different types of cars and different parameters of cars. It is necessary to establish as detailed and realistic vehicle operation model as possible and to describe the force, time accuracy, comfort and other indicators in the process of vehicle operation. Intelligent calculations are used to compensate for the shortcomings of intelligent computing in self-learning, parallel computing, global optimization and complex data processing, and further improve controller performance to optimize vehicle tracking curves. At the same time, the coordinated control module can realize the effective switching between the control variables, so that the intelligent vehicle realizes the main automatic driving function; in addition, the designed integrated control system can effectively improve the steering stability of the vehicle under extreme driving conditions. To ensure the active safety of the vehicle during the automatic driving process.

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