Research on Integrated Control Strategy of Automobile Chassis Electronic Control System

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Abstract: In the process of automobile progress and development, the electronic control system of automobile chassis has a very important effect on the safety and stability of automobile operation. Therefore, only by improving the stability and performance of the integrated control system, can the related personnel make the car run more safely. This paper analyzes the electrical system of the car chassis, mainly analyzes the car's anti-lock braking system, electronic stability program and active suspension system, and hopes to provide some advice and thinking for the work of related industries.

1. Introduction

In recent years, the consequences caused by automobile safety accidents are quite serious. At the same time, automobile accidents also bring a relatively negative impact on society. The accident of automobile is mainly caused by human factors. In addition, if the quality of automobile has problems, it may also cause safety hazards. Therefore, the relevant departments and staff must strengthen the control of the quality of the car itself. In particular, it is necessary to pay attention to the design of the car chassis system. Only by making the system of the car chassis more integrated and intelligent, can the safety and stability of the car be improved.

2. Car Chassis Electronic Control System

2.1. Anti-Lock System

In the process of automobile running, the control of wheel state is a very important part. If some emergency happens to the car, the relevant personnel can not control the wheel rotation more timely, then it is likely to lead to traffic accidents. The anti lock system can control the wheel rotation timely, in addition, it can also deal with the emergency situation. The anti-lock braking system transmits the wheel lock signal in time through the sensors on the wheel, so that the relevant controller can receive the signal in time. After receiving the signal, the oil pressure of the wheel brake cylinder is controlled to be depressurized, held, and boosted at an ideal slip ratio, so that the braking torque can be well controlled. Therefore, if the vehicle is in an emergency, the anti-lock braking system can be used to control the wheels of the car. At the same time, it can also better reduce the side slip problem caused by the car being unable to be controlled, and better protect the safety of the passengers.

2.2. Esp Electronic Stability Program

The so-called electronic stability program is mainly composed of three systems: acceleration anti-skid control, brake assist and anti-lock control. At the same time, these systems also have relatively comprehensive features. The electronic stability program mainly transmits and analyzes the real-time information of various parts of the car through sensors. Then through the car's internal system analysis of this information, issued the correct instructions, the car's state can be optimal, to ensure that the vehicle can be in a balanced state of operation. ESP is mainly composed of wheel sensor, steering sensor, lateral accelerator and other parts, which can be used to monitor the state of the car. In addition, it can better monitor and adjust the car according to the relevant information. In

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this way, if some accidents happen, we can also try our best to ensure that the car can run more smoothly, avoid rollover and rear end problems, and greatly protect the safety of passengers.

2.3. Active Suspension

The suspension system of the car is mainly to reduce the vibration of the car and improve the safety and comfort of the car. Generally speaking, the active suspension controller of the car can effectively feedback and adjust the input and output information of the relevant system of the car, so as to better realize the shock absorption of the car. In order to achieve this requirement, it is also required that the relevant system should keep the force of the action air pressure consistent with the control signals of other forces. This is also conducive to the relevant system can collect and monitor the information in the process of vehicle operation, so as to provide a better guarantee for the safe operation of the vehicle. ASS active suspension system control is complex, and the operation of the system also needs to take into account many aspects of vehicle operation. Not only the car's elastic stiffness, tire stiffness, road surface flatness, etc., but also the power of the suspension should be considered. Only when the relevant system performs a more accurate analysis of this information can we make more correct and reasonable instructions. And the active suspension system should also optimize and classify the control commands according to the calculation results, so that it can also be adjusted according to the actual situation of the car operation.

3. Integrated Control of Car Chassis Electronic Control System

3.1. Distributed Integrated Control

The so-called distributed integrated control requires the relevant system to carry out hierarchical and progressive control of various parts of the car. Among them, it is also necessary to unify and combine the high-level advanced methods of the automobile with the inaccurate methods, so that a progressive control form can be realized, and some subsystems existing in the automobile can also be separately controlled. These subsystems can also be managed uniformly. With the distributed integrated control method, the stability and safety of the car can be well guaranteed, and it has better advantages. First of all, the adoption of distributed integrated control can better ensure that the integration of some of the resources of the car is more reasonable and scientific, and can optimize the management of the car. Secondly, because the distributed integrated control can also control the internal subsystem of the car well, at the same time, it can also strengthen the unified control between the subsystems. In this process, there will be more communication between different subsystems, which will also reduce some contradictions between different subsystems, and also help to improve the overall operation stability of the car. In the application process of the integrated control of the electronic control system of the automobile chassis, the integrated control of braking and steering is a very important part, and it is also the core component of the operation and operation of the automobile. Therefore, the relevant staff should pay attention to the integrated control of the electronic control system of the automobile chassis. Through the in-depth development of vehicle braking and steering, we can know that if there is no optimal control technology to achieve control, it is likely to cause more complex linear changes in the vehicle system. This is not conducive to the stable development of the vehicle system in the operation process. Therefore, in order to avoid this problem, the relevant staff can design the integrated controller based on MPC by means of predictive model control. In this way, the vehicle's AFS and ESC system can be better integrated, and finally achieve the form of integrated control. Predictive model control can well avoid the problems caused by the interference of environmental factors and model factors, and the linear relationship of predictive model control system is also relatively good, which shows that it can improve the stability of the car in operation.

3.2. General Judgment Mechanism

In the process of vehicle operation, it needs many different systems to work together and coordinate. Only in this way can the vehicle run normally and smoothly. However, there are some

differences among various systems in the car, which may cause some control conflicts and control problems in the process of subsystem control. If we can't coordinate the relationship between different systems, it will bring negative consequences to the control and development of the whole system. Therefore, the relevant staff need to improve the form of the overall control, can take the way of building the overall decision mechanism of the overall control, so as to better help the overall system control between different systems. The relationship between different systems can also be better rationalized, which can also reduce the occurrence of control conflicts. In the process of constructing the general judgment mechanism, this requires the relevant personnel to coordinate and adjust each system according to the actual situation of each control system of the automobile and the problems and situations that may occur in the operation of each system. Therefore, it is possible to achieve more efficient cooperation between the various systems, and only the relationship between the various systems can be more harmonious and stable, so as to ensure that the automobile can achieve overall control, and finally achieve stable and safe operation of the vehicle.

3.3. Constructing an Integrated Model of Vehicle Chassis Electronic Control System

If the relevant staff wants to truly realize the integrated control of the car, then first of all, it is necessary to establish a model of the integrated control of the car. In the process of model building and design, it is mainly divided into three parts. In the first part, the relevant personnel should make reasonable selection and design of the parameters of the model. However, due to the many aspects involved in the automotive system, the relationship between the various systems is also more complicated, which shows that the car system has a relatively large complexity, and each subsystem also contains many factors. Therefore, in order to truly realize the design of the integrated control model, the relevant personnel must more accurately control the data between the various systems. Therefore, a more reasonable setting can be made, so that the requirements of the integrated control can be better met, so that the integrated control model can be smoothly applied. Secondly, the relevant staff should also perform model simulation based on the relevant parameters of the determined system. In carrying out this part, the relevant personnel need to collect and organize the relevant operational data of different parts of the car system, so as to input the data into the model, which realizes the simulation of the model. Relevant staff also need to calculate and analyze the data, then get the corresponding results, and finally determine the calculation results. If the result is beyond the allowable range, the relevant personnel should also take some measures to adjust the data, so that the data can be within the normal range. If the result is within the allowable range, it means that the relevant design provisions are in line with the actual operation. At this time, the relevant personnel can further optimize the structure, so as to make the integration model more accurate. Finally, the staff also need to carry out some scene simulation. The most important thing for us to realize the integration of the automobile chassis electronic control system is to ensure that the automobile can achieve better control performance in case of some emergencies. Therefore, the staff can set up some actual scenes in the process of experiment, and convert the situations that may happen to the vehicles in these scenes into relevant data, and finally input the data into the model for simulation. After the simulation, the relevant experimental results are obtained. Through the analysis of the experimental results, the staff finally judges the actual control performance of the integrated system.

4. Conclusion

In the process of integrated control components of automobile chassis electronic control system, the relevant staff must be clear about the relevant situation of automobile chassis electronic control system, so as to carry out the next work. In addition, the staff should also make the relevant mechanism and model construction. First, they should carry out the distributed integrated control, then set up the general decision mechanism, and finally through the model simulation to further improve and optimize. By utilizing these parts of work and design, the integrated control can be finally applied to the chassis electronic control system of the car. In the end, it is also conducive to

the integrated development of the automotive chassis electronic control system, to better ensure the stability and safety of the car operation, which has also played a role in promoting the development of related industries.

References

[1] Zhao J , Wong P K , Ma X , et al. Chassis integrated control for active suspension, active front steering and direct yaw moment systems using hierarchical strategy[J]. Vehicle System Dynamics, 2016, 55(1):1-32.

[2] Her H , Koh Y , Joa E , et al. An Integrated Control of Differential Braking, Front/Rear Traction, and Active Roll Moment for Limit Handling Performance[J]. IEEE Transactions on Vehicular Technology, 2015, 65(6):1-1.

[3] Yim, Seongjin. Selection of Actuator Combination in Integrated Chassis Control Using Taguchi Method [J]. International Journal of Automotive Technology, 2018, 19(2):263-270.

[4] Yim, S. J . Unified chassis control with electronic stability control and active front steering for under-steer prevention [J]. International Journal of Automotive Technology, 2015, 16(5):775-782.