

## Research on the development trend of smart safety technology for future cars

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**Abstract:** Cars have become a must-have tool for every household, and the number of cars per family has become an important indicator of whether a country is developed. For the current development of the automotive industry, the research of intelligent security technology has played a very important role in the future development of the car. But for the current transportation system, safety and intelligence have not been fully guaranteed. We often see reports of traffic accidents in the news, and many traffic accidents have caused a very large negative impact on society and people. Based on such a background, this paper discusses in detail the development trend of intelligent safety technology of automobiles, and hopes to play a certain reference role in the future intelligent safety technology of automobiles.

### 1. Introduction

Compared with traditional cars, modern cars have made major breakthroughs in terms of safety factor, and have greatly reduced the possibility of accidents. However, as mentioned above, driving safety is related to the safety of drivers and passengers, so even if only one percent of the risk factor is unsafe, that is to say, there are still many unsafe factors in driving. The specific aspects will be explained later. What we need to know and understand is that car driving should be a serious and serious matter. In addition to relying on the smart car's own system, the driver must always keep a clear head to prevent accidents.

### 2. Types of future automotive smart security technologies

#### 2.1 Vehicle Intelligent Technology

Ultrasonic anti-collision alarm. The occurrence of traffic accidents is unpredictable, but it can be prevented. According to the survey, 15% of traffic accidents are caused by the limited range of vision of the driver. For example, in the process of reversing the "backsight" is not good, it is very likely to cause a car accident. So how to avoid this kind of problem? The first is to enhance the ability of rear view, especially to enhance the rear view ability of large and heavy vehicles, which can effectively reduce the probability of a car accident during the reverse process. However, driving the life of the driver and passenger concerned, so the probability of a car accident should be zero. To this end, a research and development team in China, after years of research, finally invented an ultrasonic anti-collision alarm. Ultrasonic technology has been used in science for a long time. The alarm is based on this principle. By studying the principle of ultrasonic echo ranging, the object within a certain distance after the car is measured in the process of reversing the car, and MCS-51 The serial microcontroller is used as the central control unit.<sup>[1]</sup> The ultrasonic anti-collision alarm effectively transmits the distance and orientation of the obstacle behind the vehicle to the driver in a timely manner by means of sound propagation, thereby giving the driver sufficient reaction time and taking corresponding measures to avoid the occurrence of a car accident.

#### 2.2 The Cycle Control System (TCS)

The circulation control system, also known as the traction control system, is referred to as TCS, also known as ASR or TRC. Its role is to enable the car to get the best traction under all driving conditions. The control device of the traction control system is a computer that uses the computer to detect the

speed of the four wheels and the steering angle of the steering wheel. When the car accelerates, if the difference between the rotational speed of the driving wheel and the non-driving wheel is detected to be too large, the computer immediately judges that the driving force is too large. The command signal is sent to reduce the fuel supply of the engine, and the driving force is reduced, thereby reducing the slip rate of the driving wheel. The computer grasps the driver's steering intention through the steering wheel angle sensor, and then uses the left and right wheel speed sensors to detect the left and right wheel speed difference; thereby judging whether the vehicle steering degree is the same as the driver's steering intention. If it is detected that the car is understeering (or oversteering), the computer immediately judges that the driving force of the driving wheel is too large, and issues a command to lower the driving force in order to achieve the driver's steering intention.<sup>[2]</sup> Figure 1 below shows the difference in the driving path of the car when there is TCS and no TCS.



Figure 1. There is TCS (left) and no TCS (right)

### 2.3 Anti-lock brake system (ABS)

The ABS anti-lock device is a safety technology widely used in today's automobiles. Its main function is to avoid the side slip or tail-fail accident of the car due to the lock when the car is in emergency braking. When the brake disc is under heavy pressure, the system senses itself and uses appropriate intermittent to perform the closing and releasing brake action. The well-designed ABS maximizes the friction between the tire and the ground before the tire is locked, resulting in good deceleration and minimal braking distance.<sup>[3]</sup> Figure 2 below is a schematic diagram of the ABS anti-lock device.



Figure 2. ABS anti-lock device

### 2.4 Airbag

The safety of the airbag acts similarly to the safety airbag. It only protects the safety of the driver and passengers when the front wheel of the car is subjected to a strong impact. Protecting the vulnerable parts of the driver and passengers is the most important task in the event of a car accident. Includes head and chest as well as abdomen. Airbags work closely with the sensors that are distributed inside the vehicle (in-vehicle sensors are usually installed in vulnerable parts of the vehicle when they crash, such as fenders, etc.). When these sensors are hit, the control system will be very fast. These signals are sent out, and the airbag is detonated in time to play an effective protection.

### 2.5 Summary

In addition to the above-mentioned vehicle safety features, there are also fault displays, adjustable seats, high-safety tires, and various safety features outside the car. Experts predict that the future car will also make full use of the three-dimensional traffic guidance system to achieve automatic driving

and satellite automatic positioning command. Because these high-tech safety facilities are widely adopted and applied in the car, many people in the industry believe that the car will become a safer vehicle than the bicycle in the near future.

### **3. Future development trend of smart safety technology for automobiles**

#### **3.1 The future of cars is becoming more intelligent**

Like Mitsubishi, Toyota, which is also an important representative of Japanese cars going to the world, has developed a smart safety car not long ago. What makes this car special is its ergonomic design, which can minimize the driver's mistakes during driving and protect the driver and passengers. The ability to do this depends on the addition of many advanced electronic systems and an intelligent network in the design process. The electronic system uses the car's steering wheel to detect the driver's pulse. If the driver is too tired, it activates the warning system; initially, it simply shakes the driver's seat, and when the driver still does not respond, the system automatically turns off and forcibly stops.<sup>[4]</sup> The new safety car is also equipped with a collision sensing system that is primarily used to control braking. In the event of a car accident, the smart device in the electronic system can protect the engine against fire and automatically alarm.

#### **3.2 Future cars are becoming more and more secure**

Safe driving is not only the hope of all drivers, but also the goal that car manufacturers have been striving to achieve. It is an urgent problem for traffic management departments. In order to achieve this goal, consumers always pay great attention to the safety factor of the car in the process of purchasing the car, and the traffic management department has also increased the requirements for the car manufacturer. On this basis, whether the vehicle safety factor is up to standard has become an important level before the car enters the market.

In the past, the concept of car safety design was more inclined to protect the safety of passengers by strengthening the body structure. However, with the scientific development of human society, especially in recent decades, the application of computer technology, new process technology, new materials and the popularization of new design theories, cars are no longer simple metal structures, and intelligence has become an important part of car development. trend. Therefore, the safety design of the car has gradually got rid of the traditional physical structure design. For example, the design of airbags is an important manifestation of improving the smart safety factor. The airbag is a special safety factor seat specially designed by Chrysler for children and the elderly. Simply put, a cushioning device is installed on the front and side of the car. This device is in a state of strong impact on the car. It will automatically open to protect the safety of drivers and passengers; Japan has always been one of the world's largest automobile producing countries, and Japanese cars have always been competitive in the international market. Even so, however, it still has to make changes along the requirements of the times. A high-tech safety car recently launched by Mitsubishi Corporation of Japan not only has general safety facilities, but also incorporates an advanced radar detection system. The system not only automatically recognizes traffic lights and traffic signs, but also predicts road conditions ahead, and even enables automatic driving. It is a major breakthrough in the field of artificial intelligence applications in the automotive field. What's more interesting is that this car can also judge whether the driver is tired or not according to the driver's blinking frequency. At the same time, the safety warning of "fatigue driving" is promptly put forward.

### **4. Future car smart security technology needs attention**

#### **4.1 Electronic information system distracts the driver's attention**

The electronic information system can give the driver a lot of driving advice from the front, thus avoiding many traffic accidents. However, on the negative side, electronic information systems can also distract the driver's attention while driving, and may increase the risk of traffic accidents. For this reason, many car manufacturers have simplified the operation of electronic information systems when

designing and manufacturing cars. Even many electronic information devices do not require the driver's operation and can be controlled by voice or the like. According to relevant information, if a traffic accident occurs, the driver spends much more time listening to the electronic information system than he or she directly responds. Therefore, electronic information is not all good for traffic driving, and it may have a bad influence.

#### **4.2 Environmental factors**

As a very important means of transportation in modern life, cars often need to deal with different driving environments with drivers. Especially in the face of severe temperature and humidity changes, the electronic components inside the car will be very strongly affected. If it is not serious, it will only be the failure of the components. Seriously, it will directly lead to the car not being able to drive normally and cause traffic accidents. For a car's power supply, the normal voltage is 10 volts to 15 volts, but when the temperature is very low or the battery is excessively electrolyzed, the voltage of the power supply may be too high or too low.<sup>[5]</sup> If the car's power supply is not protected from overvoltage in advance, the electronic device will be severely damaged and the electronic device will not function properly.

#### **5. Conclusion**

The driving process of the entire car is affected by many aspects of the vehicle and the driver, so we cannot rely solely on the electronic equipment of the car to ensure the safety of driving. Because the electronic information system can't fundamentally solve the safety problem of driving, the driver himself has to have absolute safety awareness on the driving, and strictly abide by the traffic rules.

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