Application Analysis of Embedded System in Vehicle Electronics

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Abstract. With the continuous improvement of people's living standards, the demand for automobiles has also increased. Cars have become an important tool for people to travel. The automotive industry has also achieved very good results after many years of development, especially in the area of electronic technology. As a necessary part of automobiles, automotive electronics, and the application of embedded systems to automotive electronics has become the focus of development of the current automotive industry. Looking at the majority of controllable systems in automobiles, such as body control, engine management, in-vehicle entertainment systems, Bluetooth systems, they all rely on the help of embedded systems. For this reason, this article will focus on the application status of embedded systems in automotive electronics.

1. Introduction
Embedded systems are application-centric and computer technology-based systems. The software and hardware of the system can be tailored, and the system operates with high stability, low cost, high integration, and direct communication and integration of subsystems. With these characteristics, it has an irreplaceable position in the automotive industry. With the rapid development of electronic technology, it has become a very widespread practice to apply embedded systems to automotive electronics. The following are several common application scenarios.

2. Application of Embedded System Navigation and Internet Functions in Vehicle Electronics
The navigation system has long been the main function of the current car. With the help of navigation, the owner can go to any place he wants without having to look at his mobile phone. Navigation systems can reduce the risks of people driving in cars and enhance the driving experience. Navigation is GPS in people's cognition, but with the rise of many satellite positioning systems around the world, the global positioning satellite navigation system has a new name: GNSS, which is the acronym for Global Navigation Satellite System. GNSS has different claims in each region. It is called GPS in the United States, Beidou in China, and Galileo in Europe. The global satellite positioning system is mainly composed of three parts: the first part is the ground control part, the second part is the space part, and the third part is the car navigation receiving part. The principle of its embedded system is shown in Figure 1.
According to Figure 1, vehicle navigation first relies on GNSS to receive accurate data, such as longitude, latitude, time, and so on. Send these data to the electronic map, so that the owner can show their specific location and real-time speed, etc., so that the navigation process can be completed [1]. The above 3G or 4G module is used to connect the car with the base station of the mobile phone, thereby playing the role of assisting the Global Satellite Positioning System (AGPS), relying on the data network on the mobile phone to complete the transmission of data information, and then make the positioning Speed and accuracy reach the highest value, and it can also realize the function of Internet of Vehicles at the same time.

With the combination of these configurations, the functions of car navigation are more complete, mainly in the following three aspects: First is the function of tracking the location of the car. People can use the network to receive real-time location information of the car and display it in On the electronic map, people can easily find a car in this way. In reality, people park in the parking lot, but they will forget where the car is when they are long, and the specific location of the vehicle can be quickly located by car navigation, which also saves people time to find a car; secondly, The driving guide function sets the current vehicle position as the default departure point. After the user enters the destination, the embedded system can recommend a high-quality route to the owner based on the map information on the electronic map [2]. There are also some navigation software. In terms of high-speed priority and avoidance of tolls, you can adjust the optimal route according to the needs of the user. If the actual driving route deviates from the established route, the navigation system will also indicate that the route has deviated, and then re-plan the route. It also greatly enhances the sense of pleasure for travellers. In addition, car navigation can also accurately analyze some traffic conditions around and on related routes, thereby helping vehicles avoid congested sections, reducing the waiting time of drivers, and bringing greater convenience to people's travel; It is an anti-theft function. When the vehicle is abnormal, you can send the timely information of the vehicle to the owner's mobile phone through the on-vehicle network function, so that the owner can know the security situation of his vehicle in time.

3. Application Status of CAN Bus Based on Embedded System in Vehicle Electronics
The current automotive industry is getting better and better, the performance of cars is more stable, and the functions are more diverse. At the same time, the various structures of cars are becoming more and more complex [3]. A large number of controllers and Sensor, it is very difficult to realize the communication between the controller and the controller, the sensor and the sensor, and the controller
and the sensor. Many controllers and sensors are produced by different manufacturers and have different output formats. A reliable vehicle-mounted electronic system, and the data of each controller and sensor are aggregated together for calculation, analysis, and judgment. At this time, an orderly and reliable bus system or network is required to enable each controller and sensor. They are all connected to the same bus, and they are guaranteed to be free from interference during data transmission, to ensure the accuracy of the data [4]. The central processor can initialize and recalibrate each controller and sensor. Based on the embedded CAN bus design to meet such requirements.

CAN is a controller area network, a type of network developed by the German company Porsche. It has now become an international standard. It is mainly used in information transmission scenarios between different modules. The emergence of this network has made the previous expensive power distribution harnesses obsolete. The characteristics of the CAN bus protocol include complete serial data communication, providing real-time support, high transmission rate, good addressability, and strong resistance to electronic interference. At present, CAN bus is not only used in on-board electronic control systems, but also in elevator control systems, industrial machinery, ship transportation and other fields.

Applying the CAN bus to a vehicle requires only two signal lines (CAN_H, CAN_L) for signal transmission between nodes. This wiring method is very simple, and replaces many lines that need to cross the body, which greatly reduces the cost of wiring.

The number of private cars is increasing, and the probability of car accidents is also increasing. People now have higher requirements for the stability and safety of cars. In order to alleviate the violent impact of car accidents, airbags have become the Standard. Previously, airbags only existed in the main driver, and now many car brands have distributed airbags in the co-pilot and rear seats. These airbags receive collision signals through sensors, transmit signals to embedded processors through CAN bus, and the processors control the ejection action of each airbag. At the same time, the advanced anti-theft design on many vehicles is also based on embedded CAN bus network technology [5]. First, the legality of the key is verified through the CAN network, and the verification information is transmitted to each other through the CAN network. The verification information is more rigorous than the previous anti-theft system. Second, the car key, the anti-theft controller and the engine controller are stored the information of the other party, and there is a random code in the verification code, which increased the difficulty of deciphering, thereby improving the security of the anti-theft system. The realization of these functions is completed by the embedded CAN bus. The embedded CAN bus design has become the embodiment of intelligent vehicle control. In modern automobile design, CAN bus design has gradually become a widely used bus network device for automobiles.

4. Application of embedded system in vehicle entertainment system

With the increase of users' requirements for driving experience, the in-car entertainment system has gradually become the fourth largest system other than the three basic units of car body, transmission and safety. Embedded system In the car entertainment system, the current main hardware configuration includes LCD display, touch screen, camera, amplifier, speaker, microphone, radio, WIFI, 4G network communication module, Bluetooth, USB or SD card interface and other hardware [6].

The application of embedded systems to vehicle electronics makes the functions of vehicle entertainment systems more comprehensive. In the past, entertainment systems on cars only had simple music playback functions and broadcast functions. The current car entertainment system can download movies, watch digital TV, etc., so that people can meet various needs in the process of driving. The application of speech recognition and speech synthesis technology allows the driver to freely control the in-vehicle entertainment system while driving. Through voice commands, he can play media, answer calls, reply to short messages, set navigation, find service hot spots, and remote diagnosis, emergency repair services, etc. The camera of the embedded system is a driving recorder, which is an imaging device that records the driving process of the car. Because of the existence of many hidden dangers, in order to facilitate the later identification of the responsibility, the camera is also a necessary device for the car. Information such as time, instant speed, and location is recorded for use as evidence in incident handling.
With the rapid development of the Internet, the car is no longer a pure hardware and mechanical tool, but has become more intelligent, making driving a favorite experience for people.

5. Conclusion
The application of the embedded system to the vehicle electronics makes the performance and functions of the car more comprehensive, which greatly meets people's requirements for driving, and also makes the communication between people and the car more convenient and the experience better. In the future, the automotive industry will further develop. It is believed that the progress of embedded systems will continue to promote the intelligent development of automobiles and will also become an important boost for the development of the entire industry.

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