

(1) 自動車の機能が複雑化し智能化が進むときに想定される課題を挙げ、その課題に対し対処すべき方向性について、各自の考えを述べよ。

Electronics Technology has an extremely huge contribution to the development of automotive industry. It was applied to control engines at first, and be used for more automotive applications in many cases with the rapid development of electronics.

1, Engine Control: Engine Control Units (ECU) controls a series of parameters as air/fuel ratio, ignition timing variable valve timing, Electronic valve and idle speed on an engine to ensure optimal engine performance by reading information from sensors in the engine bay, interpreting the data by program, and adjusting the engine actuators. Rather than traditional engine control depend on mechanical and pneumatic methods.

2, Transmission: Electronic can make transmission operating in better situation, and communicate with engine to prepare for gear ratio shifting, as traditional transmission may be damaged or low efficiency because of inappropriate operation.

3, Chassis: There are many sub-systems in Chassis System, such as ABS, EBD and ETC. ABS (Anti-lock Braking System) and TCS (Traction Control System) are for stability controlling which maintain under driver's control. As ABS and EBD (Electronic Brakeforce Distribution) prevent the wheel from locking then braking faster in shorter distance and TCS control traction to match different road surface conditions.

4, Passive Safety: Electronic technology also make passenger protect device such as air bag more sensitive and stable.

5, Passenger comfort: As the electronic device become more and more intelligent, inner climate , Electronic seat, wipers and headlamps can be adjusted automatically, what's more, vehicle can be shift to private model of driver after the driver be identified.

6, Driver assistance: Autonomous cruise control system make road vehicles adjusts the vehicle speed to maintain a safe distance from vehicles ahead automatically.

7, Infotainment systems: Navigation system Vehicle audio Information access.

As the complexity of vehicle electronic devices network structure increased sharply, automotive electronics or automotive embedded systems are distributed systems, there are up to 100 ECU's in modern car and up to 40 ECUs in a commercial vehicle up to 40. ICT become more and more important to vehicle technology, and CAN bus is the subject of ICT. CAN Bus simplifying the wiring, reducing the number of electrical nodes and the amount of wire, so that assembly work is more simplified, what's more, it increases the reliability of information transmission. Through the data bus can access any one electronic control device, read the fault code for its fault diagnosis, vehicle maintenance work easier.

(2) 将来自動運転の車両が市販化され社会に導入された状態を想定し、その時に発生するモビリティ社会の問題を各自予測し、その問題を克服するためにあらかじめ検討すべき事項について、各自の考えを具体的に述べよ。

In future, as functions of vehicle from different manufacture will be more and more complicated and flexible, the coordinate problem between vehicles with different spec or intelligent car and traditional vehicles may become increasingly significant. The communicate protocol should compatible with each other, in addition, various sensing technology and powerful control unit calculate ability can make each intelligent car autonomous cruise independently.

Intelligent transportation systems (ITS) is also a prominent field.

Intelligent transportation systems (ITS) change the relation between driver, road and vehicle. As ITS provide services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks. ITS build driver-road-vehicle connected systems based on traditional automotive EE systems, vehicle must reinforce its ability of communication. Not only the communication with devices inside, but also communication with road and other vehicles in different types nearby. With more communication devices equipped, the automotive EE systems become more and more complicated, so the need of calculate ability will be raised significantly.