Application of Artificial Intelligence Technology in Smart Car Design

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Abstract. With the rapid development of information technology, artificial intelligence technology has a broad development prospect. It has been more than a century since the invention of automobile to today. In modern society, the automobile has become an indispensable means of transportation in people's work and life. The introduction of artificial intelligence technology in the process of automobile design and the continuous optimization of sensing, communication and materials in vehicle engineering can better realize the safety, economy, reliability and intelligence of vehicles. This paper illustrates the development and trend of AI in automotive industry from the perspective of technology, scenario and application cases.

Keywords: Automotive Industry; Automotive Design; Artificial Intelligence.

1. Automotive Design Changes and Artificial Intelligence Technology

In the past, automobile manufacturers and designers usually needed to use their past production experience as the basis and combine relevant technical data to design all aspects of the automobile; however, with the improvement of modern science and technology and economic level, automobile design needs to combine not only the relevant data from automobile manufacturers, but also modern consumer needs and energy environment. This has made it difficult for the previous automotive design team to fully afford the data analysis of appearance, performance, safety factor, driving comfort and product cost performance in automotive design. Therefore, artificial intelligence technology, which is capable of cognitive, predictive, decision-making, and solution integration functions, has been gradually introduced into the automotive design process, replacing a large number of repetitive mental labor actions and improving the overall efficiency of automotive design [1].

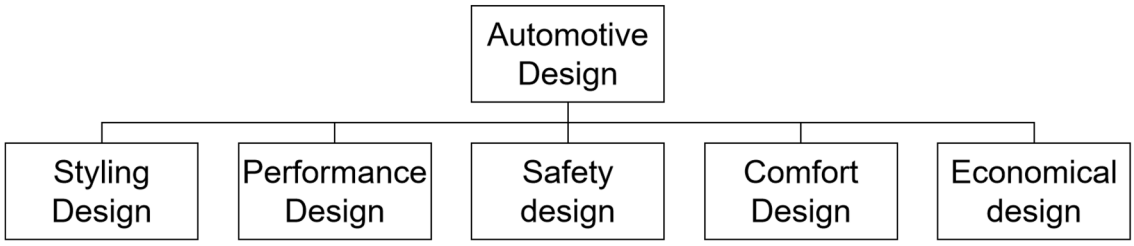


Figure 1. The main components of vehicle design

2. Application of Artificial Intelligence Technology in Automotive Design

2.1 Car Networking Design based on Big Data

Applying big data technology to the design of vehicle networking, it is mainly constructed and applied in four aspects: sensing side, transmission channel, storage side and service platform [2], as shown in Figure 2 and Table 1.

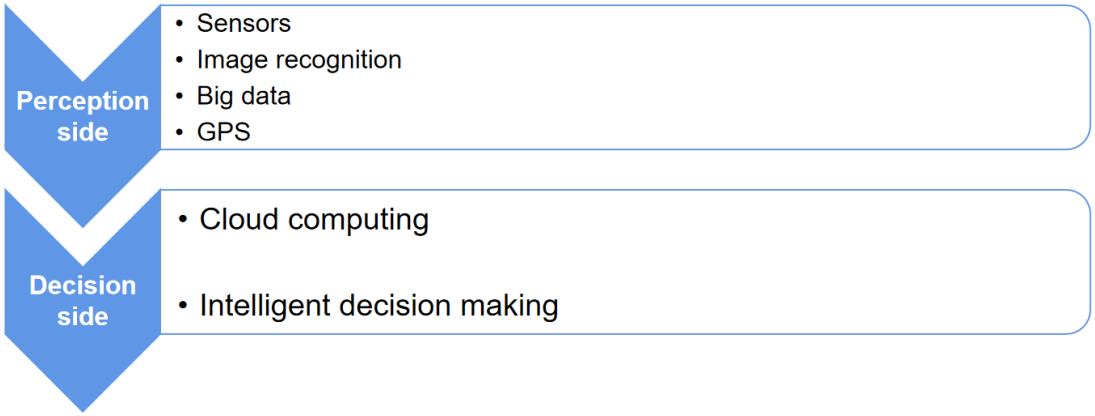


Figure 2. Car networking design based on big data

Table 1. Automotive cognitive technology key module

	Key technology modules	Contents
1	Sensor fusion	Data from the vehicle's camera, GPS, radar and LIDAR are combined to inform the vehicle's location and what the car sees on the road at any given point in time
2	Perception and maps	Perception is the way the car sees the road. It is a self-driving map, but more than that. Perception is the software that understands the software in order to acquire sensor fusion data to understand the surrounding environment. For example, an autonomous driving system needs to understand whether another car in front of it is moving toward it or away from it.
3	Localization	Localization refers to the technology that allows a vehicle to understand its location relative to a map of its environment. This is true for self-driving cars, robots, and other vehicles powered by self-driving systems, such as self-driving trucks, autonomous tractors, automated forklifts, and delivery robots. For self-driving vehicles, and even for AV functions that are pre-built into vehicles as ADAS features, localization is about knowing where the vehicle is relative to lane markings and other vehicles, shrubs, people and sidewalks. It is not as easy as obtaining the lat-long coordinates of GPS, as it is used for motion planning and requires higher accuracy than that of GPS. Positioning techniques can measure the distance of a vehicle from other objects in the environment. Another technique is to obtain a point cloud map of the environment and compare it to the objects seen by the vehicle in real time. Positioning and perception are more about the processing power of real-time computing rather than a better technical approach.

In the construction of Telematics sensing terminal, comprehensive sensing of car information is the basis of Telematics system. In the construction of big data technology applied to the perception end of Telematics, business operation data can be accurately collected to ensure that customer needs and location can be understood, and big data analysis can also be used to improve customer satisfaction and save economic costs. Applying big data technology to the construction of the perception end of Telematics is an important prerequisite for the realization of Telematics system. Car networking perception terminal construction mainly uses sensing technology, GPS positioning technology and image recognition technology, through big data technology can accurately establish information database, not only to protect the safety of consumers driving, but also for manufacturers with car networking scheduling capabilities to monitor the real-time conditions of each car and provide more private services. Similarly, the application of big data technology in the construction of the perception side of the car network, can provide information support for the subsequent cloud computing analysis and intelligent decision-making. For example, the intelligent tracking calculation of transportation vehicles can realize the intelligent scheduling of transportation vehicles. In the construction of Telematics transmission channel, the transmission channel is mainly connected to the

collection and storage of car data information. Intelligent car transmission channel can realize the collection and storage of car information data based on Internet and communication technology, provide a good application environment for the application of big data technology, and realize the timely transmission of big data car networking information data.

2.2 Application of Artificial Intelligence Technology in Automotive Performance Design

In the process of designing automobiles, the performance design of automobiles will directly determine the cost, audience and price of automobiles, and will also have an impact on the reliability of automobiles on the road. Therefore, it is a very important task to design the performance of the car. In this process, the application of artificial intelligence technology can make some projects that need to conduct actual testing to virtual modeling, which not only can save a lot of time in data analysis and experimentation, but also designers can make timely and effective modifications to the problems that arise in the simulation, so that the design of automotive performance tasks can be completed more efficiently.[3]

2.3 Application of Artificial Intelligence Technology in Automobile Appearance Design

In the process of car design, the design of car appearance is a very important part, because the aesthetic design of car appearance will directly determine the first impression and intuition of the brand of car in the society. In this process, the application of artificial intelligence technology can effectively collect and analyze the changes of modern society's aesthetic concept through big data, and combine the expected performance of the vehicle and design ideas to design the appearance of the car in line with people's aesthetics, which not only can ensure that the design of the car models in line with the aesthetics of the public, but also can effectively save the time consumption of car manufacturers in data collection and analysis, and thus This not only ensures that the design of the car model meets the aesthetics of the society, but also saves the time of the car manufacturer in data collection and analysis, thus making the production of new products faster.

2.4 Application of Artificial Intelligence Technology in Automobile Safety Design

In the process of the car on the road, the safety of the car driving is also a very important element, if the car in the safety design problems, not only affects the life safety of the passengers, but also the reputation and competitiveness of the car manufacturers themselves. In this process, the application of artificial intelligence technology can simulate and predict some common car safety problems in the past, and then submit to the car designers the possible safety hazards in the current design of the car, and even put forward some corresponding modification opinions and suggestions on this basis, so as to make the car safety performance related to airbags, hand brakes, ABS anti-lock braking system, etc. to get more scientific and reasonable arrangements. etc. can be arranged more scientifically and reasonably.[4]

Take the car mirror system as an example, according to the car mirror system composition structure is mainly position following system artificial intelligence and mirror adjustment system connected, using the Internet of Things chip to fully monitor the driving position, so that the driver driving process can automatically control the mirror, so as to understand the driving position of the vehicles on both sides, to avoid the risk of tailgating vehicles in driving. In the past traditional vehicles, rearview mirror adjustment often requires manual adjustment, which is easy to cause distraction and cause accidents, and independent adjustment requires a certain amount of time, cannot guarantee that the driver can be in the vehicle safety driving can complete accurate adjustment, which will use artificial intelligence to calculate the optimal car mirrors, and even record the driver's rearview mirror preferences in a variety of environments, the first advantage is to allow the rearview mirror adjustment More in line with the driver's individual needs, according to the driver's different driving environment and adjust. The second advantage is to significantly improve the driver's operating efficiency, which ensures that the rearview mirror can be operated to a reasonable range at a time.[5]

2.5 Application of Artificial Intelligence Technology in the Design of Automobile Comfort

In the process of purchasing a car, the comfort of the interior of the car is often one of the important criteria for people to choose a car, and its priority even exceeds the consideration of the car's performance to a certain extent, which makes the design of the comfort of the car become one of the important aspects of the car design process. In this process, the application of artificial intelligence technology can load the ergonomic structure and other corresponding data information and analysis, and then through the adjustment of the interior design of the car cabin to make people more comfortable driving experience; in addition, artificial intelligence technology can also analyze the difference in the feeling of the interior environment of the car cabin using different materials in the process of car design, so that the car's comfort can be improved more effectively.[6]

2.6 Application of Artificial Intelligence Technology in the Design of Automobile Economy

In the process of automobile design, the design of automobile economy is also a very important element, which not only directly affects the production cost of the automobile, but also determines the audience and the related product promotion plan after the automobile product is launched. In this process, the use of artificial intelligence technology can effectively analyze the use of the car by the corresponding audience, and thus determine in which aspects of the process of putting the car into use need to strengthen the quality, and in which aspects can be appropriate to control the cost, so that the car product can show a better performance to price ratio for the target group, and thus make the car product in the fierce market competition In this way, automotive products can demonstrate a better performance-price ratio for the target group, and thus enable automotive products to occupy a leading position in the fierce market competition.[7]

3. Conclusion

In the process of the development of the automotive industry in today's society, artificial intelligence technology has been very widely used to achieve overall efficiency and economic benefits for many automotive manufacturers in the design, production and manufacturing processes. Although China's start in artificial intelligence is relatively late, but with the development of science and technology progress, artificial intelligence technology will be able to effectively promote the automotive industry to achieve a new transformation.

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