Research on Distributed Decentralized Management and Control Mode in Intelligent Networked Automobile Industry

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Abstract: With the significant steps of joint efforts in intelligent vehicle and vehicle network technology has foster clustering to an emerging industry-intelligent network car industry. Its distinctive industrial characteristics completely subvert the control laws of traditional industries and promote enterprise management innovation and business model remodeling. In this paper, the development of the intelligent network car industry is described in detail, the characteristics of the industry are analyzed, putting forward the effective distributed decentralized management and control model, and the development direction of the industry and the prospect of industrial promotion and application are predicted.

Key words: Intelligent Networked Automobile, Emerging Industries, Distributed, Decentralized Management

As an important product of the deep integration of informatization and industrialization, intelligent vehicle (unmanned autonomous vehicle) and Internet of vehicles are not only brought out a new industry, but also greatly promoted enterprise management innovation and business model remodeling. Intelligent network automobile industry integrates burgeoning design, production, management, control and sales mode. Its innovation subject, innovation content and pace of innovation will bring unprecedented life experience and feeling to human society. Intelligent vehicle and Internet of vehicles blend many emerging technologies and intelligent management modes, such as real-time perception, Internet communication, autonomous driving, autonomous navigation, etc. [1]. As an emerging industry, intelligent vehicle and Internet of vehicles have completely overturned the problems and laws of formation that we used to reflect on and form in the manufacturing and management of automobiles. Therefore, it is of great practical significance to deeply study the development law of intelligent netted vehicle industry, constantly innovating the thoughts of industry management and control, and explore the distributed decentralized management and control mode to ensure the safety of Internet of vehicles information and the reliable operation of intelligent vehicles.

1、 Industry overview

With the advance of economic development and scientific and technological revolution, the automobile industry has ushered in significant development opportunities and transforms. Driven by the twin-engines of "Internet +" and Intelligent Manufacturing", new-generation information

technologies such as artificial intelligence, Internet and Big Data are deeply integrated with the automobile industry, which has promoted the rapid development of the intelligent netted automobile industry. Even the capital and technology market of some famous companies such as Google, Apple, Baidu, Alibaba,Tencent, Internet companies such as Huawei, have made among the intelligence automobile industry competition [2]. Not only for Benz, BMW, Ford, Toyota, Beijing automotive industry at home and abroad, BYD, Geely and other traditional auto makers flock in them either.

Although the intelligent network auto industry in the United States, Japan and the European Union and other countries started early, but in recent years, the development is booming in China, becoming a rising star. At present, China has been in the golden development period and demonstration and application stage of intelligent netted automobile industry. Smart cars are not only widely used and have great industrial potential, but also a key area for the country to grow and strengthen new industries, gain new competitive advantages and cultivate new drivers of development. The real-time online service of the Internet of vehicles has been widely used in various fields of economy and society, becoming an important symbol of national scientific research strength and an important direction of a new round of industrial revolution. The new intelligent transportation service model brought by this will have a significance milestone for improving traffic efficiency and safety monitoring level. According to the National Development and Reform Commission, Ministry of Science and Technology (MOST) and Ministry of Industry and Information Technology had jointly released by the ‘Auto Industry Long-term Development planning’, forecasting that, by 2025, a car driving auxiliary, part of the automatic driving, conditional function such as automatic driving and fully automatic driving the new car assembly rate will exceed 80%.Car networking market size is 78.5 billion Chinese Yuan in 2017, and estimating reaching 114.2 billion in year 2018, is expected to market scale will reach 368.2 billion to 2022, the market will be more than $2025 [2], the huge potential for growth. The market size development trend of China's intelligent network alliance automobile industry is shown in figure 1.

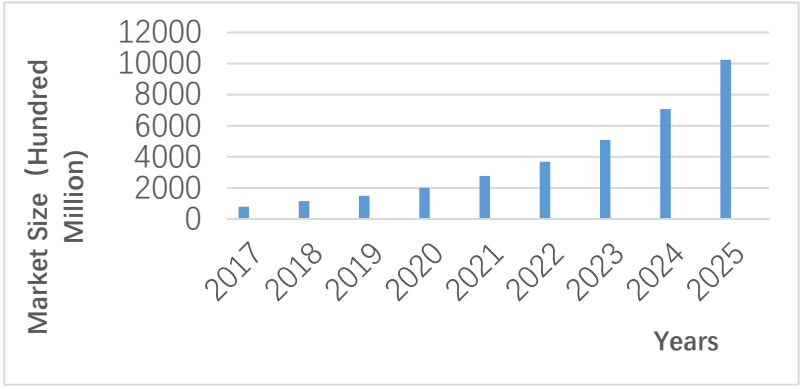

Figure 1 Forecast chart of market size of China's intelligent network automobile industry

2、The characteristics of the industry

The industry characteristics of intelligent network link automobile industry has obviously symbol, which is a high integration of new generation information technology and intelligent control and intelligent management. Generally, it consists of two major industries: Single Intelligent Vehicle and Internet of Vehicles. It is a typical application and product of the era of traditional automobile and Internet +, and an emerging industry with the most clear industrial prospect and market demanded. In addition, to the traditional electromechanical structure and driving equipment, intelligent network connected vehicles also add functions such as environment perception, information sharing, intelligent decision-making and autonomous control. Generally, it realizes the information connection and distributed management and control among vehicles, vehicle and management companies, and vehicle and traffic management departments through the Internet platform and network communication technology, and develops rapidly towards the direction of networking and intellectualization, and finally realizes the management and control objectives such as comfort, safety, efficiency and energy saving of intelligent networked vehicles. As shown in figure 2, the industry chain of the intelligent network automobile industry is dotted with capital chain and solid with service chain. It mainly includes three chains: production, service and capital. It involves not only traditional automobile manufacturers, 4S stores and users, but also many service providers such as intelligent vehicle system, Internet of vehicles, navigation and telecommunication [3].At present, China has favorable conditions in artificial intelligence, big data, Internet of things and 5G communication technology. It has a complete supporting system for production, learning, research and application. National related management departments and production enterprises should be promptly seize intelligent snatched auto industry new opportunities of development, strengthen the top-level design and standards, promote research and development of communication chips and control module, support automated driving technology and demonstration application, pushing the car networking integrated data platform construction and open interface, constantly explore new technology for the future of intelligent travel service, the new model, building security, intelligence, sharing system of comprehensive transportation service. Research and seek breakthroughs in key technologies such as on-board chips, wireless communications, autonomous driving, intelligent perception and operating systems. Make full use of China's advantages in the field of new energy vehicle manufacturing to push the intelligent netted vehicle industry to a commanding height in the world.

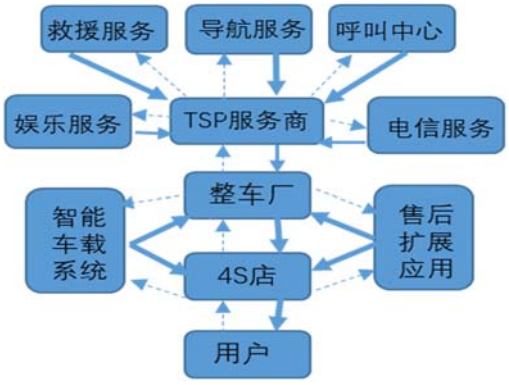

Figure 2 Schematic diagram of the development of intelligent network automobile industry chain

3、Distributed decentralized management and control mode

Distributed decentralized control is an effective means to manage and control complex systems. In general, the management and control of intelligent networked automobile industry is realized based on the Internet of vehicles and cloud platform through big data real-time processing. The so-called distributed decentralized management and control is the combination of networked decentralized control and centralized management [6].Generally, it is composed of two levels of management and control: the decentralized control layer is mainly composed of information perception, real-time communication, optimal control, autonomous driving and safety prevention, with obvious real-time and safety characteristics. The centralized management is based on information transmission, data processing, path navigation and optimization decision-making, which has the obvious characteristics of high efficiency and reliability. In decentralized control, each made vehicles as an independent agent, by decentralized control can be achieved when the system is a technical fault or running safety, each smart cars still have independent real-time control and security ability, even if the individual intelligent car or parts of technical failure also not affect network out of control and lead to paralysis of the whole system, greatly improved the overall security of the network system, can reduce the risk control to the greatest extent. The centralized management of the system through the big data platform of the Internet of vehicles could realize the sharing of road conditions and information resources, make path planning and navigation more reasonable, and make management decisions and optimization services more efficient. With the rapid development of intelligent vehicle and Internet of vehicles technology, driven by the new generation of information technology, intelligent Internet vehicle industry is developing towards the direction of diversification, networking, openness, centralized management and decentralized control. Made between different vehicles and different areas and

traffic administration through the smart grid of the general assembly data platform to realize data storage, data transmission, data mining and data analysis and processing functions, such as cars and people, vehicles and road, car and car information direct connectivity between, realize the industry and traffic administration of unmanned vehicles for effective control and supervision, and at the same time, provided professional multimedia and mobile Internet application services. Let people really feel the emerging travel mode and comfortable transportation experience brought by modern technology. The distributed decentralized management and control mode of the intelligent network vehicle is shown in figure 3.

Figure 3 Distributed decentralized management and control mode

Distributed intelligent snatched the automotive sector is collecting and distributing control mode is multidisciplinary, interdisciplinary and comprehensive method of complex system to study the new thinking of management and control integration, and through the adoption of the rolling optimization and integrated research method for transportation system management and control scheme of the online simulation, evaluation and optimization, whether in theory or in application, all has the very vital significance. Generally realize intelligent Shared league of monomer is the key links in the car network, vehicle information such as position, velocity and road conditions is network transmission to the intelligent traffic management center by car cloud platform, and then by the information technology of data analysis and processing, and the location of different vehicles is calculated, the best route and energy saving operation mode. Generally, intelligent Vehicles and Internet of Vehicles can fully realize intelligent traffic information service and distributed decentralized control of intelligent vehicles after they go through three stages of information interaction, coordination and perception, and network decision-making.

4、Development Direction

To promote the development of the intelligent snatched the automobile industry, state and

local governments have introduced related support policy and standard specification, pay attention to solve the bottleneck problem of management, strengthen the innovation mode and the top design, traffic accident analysis and positive research that mechanism, unceasingly will intensify research of key technology of common, promote industrialization projects and major industrial base platform construction to fall to the ground as soon as possible, to explore the implementation of traffic data open sharing, improve the protection of intellectual property rights, actively participate in international standards, strengthen international exchanges and cooperation, promoting the international influence of the industry.

In the future, the development of intelligent network auto industry should focus on the following six aspects [5] :

Firstly, it will continue to innovate systems and mechanisms, accelerate the technological upgrading and transformation of traditional automobiles, change traditional driving behaviors and gradually accept the concept of unmanned driving.

Secondly, promote actively the large-scale manufacturing and technology industrialization of the core components of intelligent network vehicles. Transform the vehicle manufacturing system of driverless cars, accept personalized customization, and build a networked collaborative intelligent manufacturing industry chain.

Thirdly, to speed up the development of intelligent road network technology with vehicle-road collaboration as the core, carry out intelligent road network reconstruction and satellite ground station construction, and improve the overall perception of the road network.

Fourthly, the smart travel management system and service mode should be established as soon as possible to realize the optimization of traffic signals, traffic organization and traffic guidance based on the big data cloud platform.

Then, the efforts will be made to improve the road intelligent network communication infrastructure, and develop 5g-based Internet of vehicles chips, communication base stations, vehicle-mounted terminals and other key networking equipment.

Lastly, we will vigorously develop the high-precision digital map and Beidou Navigation industry, and support the development of the self-organizing, self-learning and self-adaptive capabilities of the internet-connected vehicles.

5、Application Perspect

Intelligent network auto industry has become the high point of a new round of global industrial competition. The government, industry and the scientific and technological circles have accelerated the layout in this field, and take the lead in the demonstration and application of

private cars, freight and rental in airports, docks, stations and other public places, and then gradually expand to the field of family and personal applications. Although China started late in the field of intelligent network vehicles, the development speed is beyond world expectation. Beijing has made it clear that by 2022, a complete technical system and application service standard for intelligent networkers will be basically formed. The demonstration operation area will exceed 500 square kilometers, and the industrial scale will reach 100 billion Chinese yuan [5]. Huawei has also officially entered the field of Internet of vehicles, and has successively cooperated with Audi, Volkswagen, Toyota, Dongfeng, and other vehicle manufacturers in the fields of Intelligent Vehicles and Internet of Vehicles. Baidu's research and development of car networking open platform (Apollo) has been the national designated as a new generation of artificial intelligence to drive innovation platform, and with BMW, Mercedes-Benzes, Ford, Hyundai, Honda, and Baic major car manufacturers such as new energy, BYD, joint development of unmanned vehicle has been on the rings motorways , ran to the Xiongan and Hong Kong-Zhuhai-Macao bridge. Alibaba also recently announced the development of a new Internet of things operating system, which will allow drivers to make reservations and conduct online settlement via autonmap through its Alipay online platform. Tencent is developed based on WeChat and QQ open car networking control platform, its unique product content and services positioning attracts many heavyweight partners, including Volkswagen, Ford, gac, Changan, Geely, Dongfeng, BYD, and so on, through the platform has achieved many people travel, location, sharing, real-time intercom driving, opens the comprehensive intelligent car new era. The development and technology promotion and application of intelligent network vehicle industry in the next five years are shown in figure 4

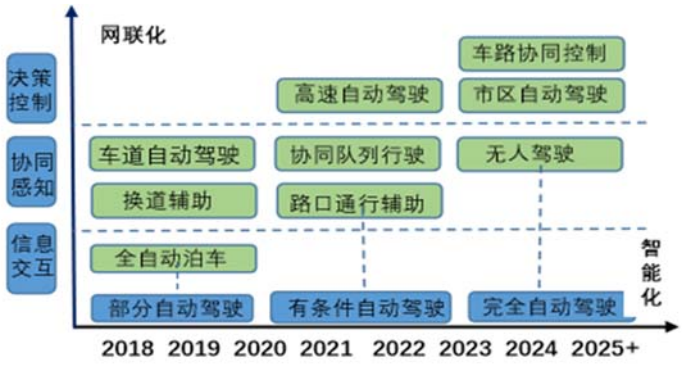

Figure 4 Network car industry technology development trend chart

Some autonomous driving can be achieved by 2020, including fully automatic parking, lane changing assistance and automatic driving in general lanes. Conditional autonomous driving can be realized around 2022, including automatic crossing, coordinated queue driving and high-speed autonomous driving. After 2024, it can achieve full automatic driving, and realize advanced functions such as unmanned automatic driving and coordinated optimization control of vehicle and

road in the urban area.

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