
The Impact of the Application of Intelligent Vehicles in Cities on Urban Development

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Abstract – The purpose of this project is to analyze the impact of the application of intelligent vehicles in cities on urban development. The analysis is based on data from China's first 16 smart car pilot cities. According to the research results, it is confirmed that the development and application of intelligent vehicles have changed the way people travel, improved the efficiency of urban operations, and had a greater impact on the construction, planning, management, and other aspects of the city. Another research focus of this project is to establish a relevant urban smart evaluation model based on the research results, to provide guidelines for the formulation of smart car city application schemes in other Chinese cities, and to form replicable and popularizable experiences, to promote the sustainable development and intelligence of Chinese cities. This paper has not mentioned it for the time being.

Keywords – Smart Car, Urban Development, Social Influence.

I. SOCIAL IMPACT

The application of smart cars in cities has produced a historic change in the way urban residents live and work, and the relevant programs and specific implementation guidelines have not yet been experienced in the world. China, as the first country to carry out the pilot development of intelligent vehicles nationwide, has achieved phased results. The main social impact of the application of smart cars in pilot cities can be divided into positive and negative parts, As shown in Figure (1), the positive part is as follows: (1) change the way urban residents travel and provide a new idea for solving urban traffic congestion;(2) provide an intelligent model for urban planning, construction and management. The negative parts are (3) the unemployment of workers in the vehicle industry, and (4) the privacy security of urban residents is threatened.

II. METHODOLOGY

This project covers 16 pilot cities of smart cars in Beijing, Shanghai, Guangzhou, Wuhan, Changsha, Wuxi, Chongqing, Shenzhen, Xiamen, Nanjing, Jinan, Chengdu, Hefei, Cangzhou, Wuhu and Zibo. It mainly includes the number of intelligent intersections, the number of 5G base stations, the number of autonomous vehicles, the cumulative test mileage, the number of autonomous taxi services, the feedback data of passengers, the number of kilometers of intelligent highways, and other data. Table 1 provides the specific data of some pilot cities of intelligent vehicles. The project is mainly divided into two parts. Analyze the social impact of the application of smart cars in cities on urban infrastructure and residents' lifestyles, and finally establish the urban intelligent evaluation model. The second step is to build the urban intelligent evaluation model and apply it to the urban application construction of smart cars in other cities [1]. The second step is still under study.

III. RESULTS AND SOCIETAL IMPLICATIONS

The data results show that the application of smart cars in cities has indeed had an irreversible impact on citi-

-es. The impact is not limited to urban traffic, it has changed the living environment of urban residents and caused great changes in residents' privacy, security, employment, etc. Planning, construction, and management of cities have a huge impact and unpredictable unlimited potential. The impact is mainly divided into the following four parts:

Change people's lifestyles and solve traffic congestion. Smart cars have begun to enter the stage of real and effective application, and automatic driving travel, intelligent bus autonomous parking, unmanned distribution, unmanned sales, unmanned cleaning, and other scenarios carried out in Beijing, Shanghai, Suzhou, and other cities are quietly changing the production and life of the city [2]. As shown in Figure (2) the efficient coordination of the pers-on-vehicle-road-cloud-network, not only improves the efficiency and safety of traffic operation but also brings better travel experience to citizens. In Beijing, the capital of China, through the intelligent transformation of 60 square kilometers of roads, traffic control law enforcement, traffic target monitoring, information control optimization, data fusion calculation, and V2X (vehicle-to-outside information exchange) function application, smart cars play their functions in the city, helping to alleviate urban traffic congestion. At present, the road congestion mileage in the morning and evening rush hours in the demonstration zone has been reduced by 29.14% and 22.41% respectively, the average number of daily stops on the Green Wave trunk line has been reduced by 20%, and the working risk per 10,000 kilometers of vehicles has been reduced by 23%. In Changsha, China, the country's first intelligent customized bus route for commuting scenes was built, which shortened the travel time by 13.3% on average, and the on-time optimization rate reached 80% during peak hours, effectively improving the commuting efficiency of citizens [3-5].

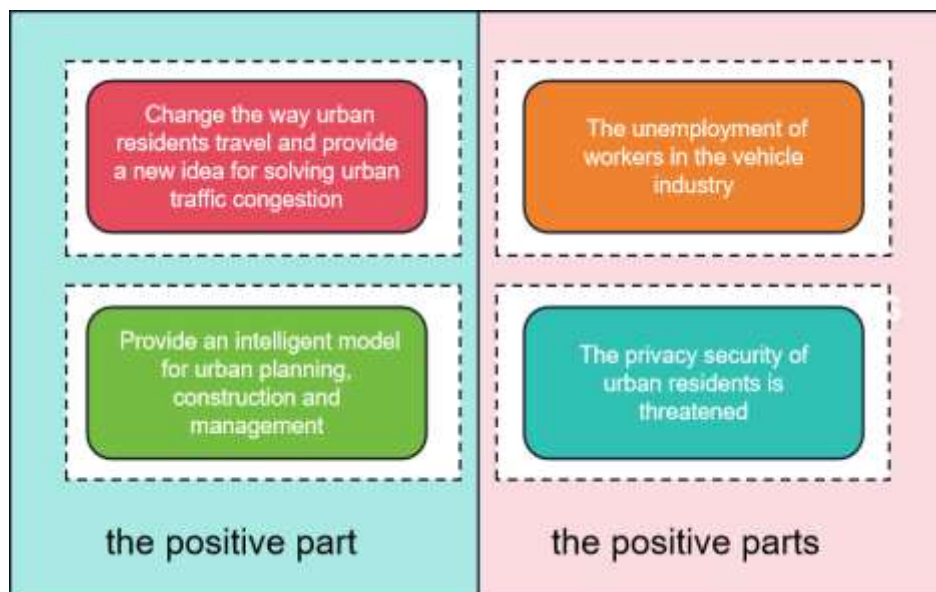


Fig. 1. Major social impact.

It provides a digital model for urban planning, construction, and management. In the past two years, according to the public data of 16 pilot cities, the double smart pilot city project has achieved phased results, setting up perception facilities such as cameras, millimeter-wave radar, and Lidar at more than 2,000 key intersections, as well as intelligent infrastructure such as RSU and roadside computing units, and building 240,000 5G base stations. Some cities have built a car city network platform, and 1,700 L4 autonomous vehicles have been put into application scenario testing, with a cumulative test mileage of 27.3 million kilometers and a

cumulative service of 3.8 million people, laying the foundation for the application of smart cars in cities. Digital infrastructure enables smart cars to perform their functions perfectly [6]. By building a vehicle-city networking platform, pilot cities collect multi-level dynamic and static data, and use digital means to achieve intelligent management in infrastructure, environmental governance, urban transportation, public services, disaster prevention, and emergency response [7]. Promote the development of smart transportation, reduce traffic congestion, promote the improvement of public services, and improve the overall operation efficiency of the city; The realization of data sharing, improving the overall appearance and environment of the city, is more conducive to the economic and social development of the city, promoting the transformation and construction of urban transportation infrastructure and the research and development, upgrading and promotion of intelligent connected vehicles, and also provides opportunities for the development of related industries in various cities to play the agglomeration effect.

Leading to increased competitive pressure or unemployment for full-time drivers in pilot cities. In 40 pilot cities such as Beijing, Shanghai, and Shenzhen, driverless cars have been put into trial operation. Among them, China's Baidu Apollo Robotaxi has been put into use in the pilot city of Changsha, with free trial rides (within 130 kilometers) during the trial operation stage, which has caused a huge impact on the taxi industry in Changsha [8]. Although there is no specific unemployment data for full-time drivers, according to Johnson & Johnson, the largest taxi company in the pilot city of Shanghai, the operating profit of the company's taxi has increased from 48.92% in 2007 to 22% in 2013, but the operating profit in 2021 is only 1.82%. Due to the application of a variety of computer technologies, autonomous vehicles make the completion process of vehicle driving more intelligent and economical. According to preliminary findings, the new era of autonomous driving and car sharing will cost only one-third of the cost per kilometer of current private cars [9].

Threatening the privacy and security of city residents. As we all know, data is the basis of automobile digitalization and intelligence, and to achieve autonomous driving, assisted driving, human-computer interaction, intelligent network connection, intelligent network vehicles need to constantly collect environmental perception information, vehicle working condition information, and driver and passenger information, and use this information to provide "thousands of faces" personalized services [10]. More and more personal information of drivers, passengers, and people outside the car is collected, used, and shared, resulting in privacy risks, "2022 Chinese Consumer Intelligent Connected Car Data Security and personal privacy awareness and Concerns Survey" shows that Chinese consumers at this stage of intelligent connected car manufacturers can properly protect personal sensitive information overall confidence is insufficient [11]. Among them, the proportion of respondents who highly mind that sensitive personal information is collected, used, and shared by intelligent connected cars is as high as 77.4%. Thirdly, the ignorance of personal information protection laws and regulations and the ignorance of how to protect rights also aggravate the concern of car users about personal privacy disclosure and its consequences. Among them, nearly three-quarters of the respondents do not know which rights and interests are protected, let alone how to safeguard their legitimate rights and interests [12].

To sum up, the research results fully verify the value of the application research of intelligent driving vehicles in urban construction, which can change the lifestyle of urban residents, reduce urban traffic jams, improve urban operation efficiency, and provide infrastructure support for the construction of digital and intelligent urban management platforms. However, there are still many problems that need to be solved, such as

unemployment problems faced by urban residents due to urban intelligence, personal data privacy and data security problems, and business models for sustainable urban development, which are all issues that need to be considered in the next step of the development of smart car cities. The above research can provide a certain reference for the automobile development and construction of other cities in China.



Fig. 2. The impact of the application of intelligent vehicles in cities on the lifestyle of urban residents.

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