

Research on Market Prospect of High-Level Automatic Driving

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Abstract. Autonomous driving is considered the future application in the world, but its market is still unknown. This article first examines the economic context in which autonomous driving occurs and uses statistical data to find that most of the population is receptive to autonomous driving as new and unconventional technology. This is good for the autonomous driving market. However, the survey indicates that there are still some threats to autonomous driving systems. Firstly, there are legal restrictions, and secondly, there are bottlenecks in path planning technology. It is also worth mentioning that the Tesla brake failure in 2021 has dealt a double blow to the autonomous driving industry, both socially and technologically. At the same time, the article analyses the consumption patterns of the autonomous driving industry and finds that autonomous driving is a promising industry. Still, to have a good market, it first needs to improve the technology and ensure that the data is accurate.

Keywords: Automatic driving; Tesla; Lidar; Development.

1. Introduction

"It seems that not long ago, people often said that the discrimination ability of computer vision was not as good as that of one-year-old children. However, only a few decades later, this sentence seems to be about to be rewritten. Computers can recognize objects in pictures like most adults and drive cars on the road more safely than 16-year-old teenagers. What's more amazing is that today's computers no longer passively recognize and drive according to instructions but independently learn from experience, just as life in nature began to evolve millions of years ago." [1]

The above paragraph is quoted from a paragraph in the deep learning revolution that Sejnowski and Terrence J published in 2018. It is not difficult to see that in recent years, with the rapid development of the economy, the topic of automatic driving technology has been paid more and more attention. People hope to see the phenomenon that autonomous vehicles completely replace human manual driving as soon as possible. Still, the industry of autonomous driving may take some time to achieve this goal, to cover different needs, road conditions, people, and business models. To better distinguish different levels of autopilot technology, SAR International released a six-level classification system of autopilot in 2014, which is divided into level 0, level 1, level 2, level 3, level 4, and level 5. From the classification standard of SAE, at present, most of the people driving cars are at the 0-1 level. The current automatic driving companies are mainly divided into two categories. One is the 3 level from 2 levels to monitor the road conditions through the system. Another kind of self-driving automobile company starts directly from the 4 levels, and tries to directly solve the problem of liberating human drivers in most cases. But so far, the most common in the market is still L2-L3 level automatic driving technology. Although many companies claim to have mastered L4 level automatic driving technology this technology has not been mature enough to market. At present, it is only gradually landing and trying [2].

However, with the gradual vigorous development of automatic driving itself, there are still many accidents with the maturity of automatic driving technology. For example, -Tesla, a well-known auto-driving car company, was reported by the media for the failure of brakes, causing a great disturbance. With the Tesla accident reported, it seems that more and more media begin to report on the risks

related to automatic driving, and consumers seem to be worried about the prospect of automatic driving because of these reports.

2. Literature review

With the advancement of time and technology, autonomous driving is becoming more and more closely linked to the daily life of the general public. Wintersberger et al. tend to find out if Austrian consumers are ready to use AVs and which challenges will arise with the implementation of AVs. Additionally, consumers' attitudes toward sharing models were analyzed. The data for this study was collected using an online, user-friendly, Likert scale survey. The collected data were processed and analyzed for empirical significance in SPSS using Spearman's rank correlation and the Mann–Whitney U test supported by descriptive analysis. The results show that Austrian consumers perform well and understand autonomous vehicles and their technologies. However, they are worried about the reliability, network security, and other specific future car sharing mode issues. What could not be neglected is that consumers still have a high sense of subjective safety for conventional cars despite the high traffic accidents. These factors may affect the promotion of autopilot cars [3]. Fagnant and Kockelman seek to explore the feasible aspects of AVs and discuss their potential impacts on the transportation system. Reviewing the existing literature and solving the difficulties encountered in the literature and discussion with an expert has become the main research method. Finally, the conclusion is as follows: The idea of an automatic car may seem a distant possibility, but automation technology is improving quickly, and some semi-autonomous features are already offered on current vehicle models. This new technology has the potential to reduce crashes, ease congestion, improve fuel economy, reduce parking needs, bring mobility to those unable to drive, and over time dramatically change the nature of U.S. travel [4].

Winner adopts the method of comparing various introduction strategies and discussing various terms and features to study the related issues of safe automatic driving. It is pointed out that to realize automatic driving, the safety level acceptable to both users and exposed personnel must be achieved. However, it is extremely difficult to establish this safety level. Although Winner thinks that the safety level of automatic driving is so high, its achievements can only be concluded after introducing automatic driving technology into the market and long-term observation [5]. In addition, Kaltenhäuser et al. aim to study the market development of autonomous driving in Germany, presenting a model to predict the market penetration of autonomous cars for passenger transportation, focusing on autonomous taxis without a steering wheel. For this, a discrete system dynamics model was created and evaluated where the input parameters have been taken from the literature and a survey. The results show that most autonomous vehicles will be private, and autonomous taxis will reach a maximum of 2.4 million in 2038. At the same time, it is estimated that by 2040, the proportion of people who mainly travel by taxi and public transport is expected to rise from 20.0% today to 32%. By then, about 19% of people will use an automatic taxi at least occasionally. Lastly, the vehicle miles traveled are expected to increase by 25% with people switching from public transport to autonomous taxis [6].

Willian wrote this report on attitudes towards fully automated driving (FAD) and its acceptability. The author questioned 432 French drivers online by means of a questionnaire. Of these, a total of 153 men were in the age bracket of 19 to 73 years. The authors collected all the data and produced a graph. The results showed an a priori acceptability of fully automated driving, with 68.1% of the sample opting for it. Even if the participants did not try such a car, they had a positive attitude towards it. Furthermore, attitudes and a priori acceptability seem to be complementary concepts when evaluating the intention to use FAD. Finally, manufacturers should be aware of the potential risks of misuse that should be considered when developing and designing FADs [7]. Murat's report writes that some vehicles with autonomous driving capabilities are already on the market. However, there are still many perceived factors related to autonomous driving that need to be addressed. The most important is the level of trust drivers have in autonomous driving systems and how they can adjust that level of

trust based on their experience. The paper reports on the results of a survey conducted with Tesla drivers. The results show that drivers have a high level of trust in the Autopilot system, that trust decreases with age and that trust in Autopilot is low among people who have had a vehicle accident. But in general, trust in the Autopilot system increases over time [8].

However, Pavlo believes that fully automated driving will bring enormous benefits to society. However, he is not sure whether people will be resistant to this technology. The study investigated anonymous comments about fully automated driving and summarised them. All data was obtained from three online surveys. The sample was mainly male, and the average age was 32.6 years. The study required 1,952 comments to be classified into at least 12 categories, including positive or negative attitudes. The findings show a split in public opinion on fully automated driving. Many respondents had a positive attitude towards autonomous driving, but a significant number also had a lot of negative feelings towards fully automated driving [9]. Furthermore, Murat mentions that it is essential to understand the driver's experience of using automated driving with the advent of automated driving. The authors surveyed Tesla owners who use Autopilot and Summon, two automated plus black wire features. The results show that these users have extensive driving experience and are concerned about how automation works. Surprisingly, even though failures are common with automated driving, people did not see them as a risk. Furthermore, most drivers emphasized the need to be vigilant when using automated driving functions [10].

Frank et al. analyses the functional, economic, hedonic, and symbolic advantages and disadvantages of robotic vehicles as perceived by customers and how these advantages and disadvantages generate value. Furthermore, the implications for online customers intending to purchase and recommending robotic vehicles. By means of cross-national customer data, this study identifies what drives customers' intention to purchase and adequately recommends autonomous and partially autonomous robotic vehicles in different legal scenarios. These results are relevant for managers, policymakers, and researchers interested in improving customer orientation in automated driving technology development [11]. And then, Wang et al. studied the Chinese market's acceptance of autonomous driving through a questionnaire survey. Research shows that consumers are more concerned about the development prospects of intelligent driving vehicles and are concerned about their technical safety. In addition, the acceptance of intelligent driving cars depends on age. The higher the expectation, the earlier the purchase of intelligent driving cars, and so on. Ninety percent of respondents were willing to buy smart cars and would pay extra to buy them. This result will provide an objective reference for the government to issue laws and regulations related to intelligent driving vehicles to support P and can help enterprises adjust the research and development direction of intelligent driving vehicles [12].

Zhang through the analysis and research of domestic and foreign relevant information and combined with their own learning content and industry background to illustrate the development and prospects of intelligent vehicles and the status quo of China's automobile industry. Automatic driving technology is an important part of an intelligent transportation system. At present, many cities in our country have their own or the introduction of foreign advanced technology and experience after the launch of new products or the development of some self-owned brand models to meet the market demand, and achieve good results, has become one of the future trends. Through the study, the paper concludes that unmanned ticketing and electric cars have different advantages from traditional cars and analyzes their development prospects as well as the challenges they face under the status quo and application conditions at home and abroad [13]. Finally, Frank et al. worked out the psychological factors that influence people to hand over control to intelligent automation and studied the persuasion techniques that encourage people to hand over control to intelligent automation. Studies have shown that the philosophical aspects play a role in handing over control to intelligent automation, such as the ethics of persuading people to relinquish control and the liability for accidents resulting from the use of automation [14].

The main objective of this article is to examine the future prospects of autonomous vehicles. It first examines the market context for self-driving cars, which includes data on the attitudes of a

number of different people towards autonomous driving and a study of the legal issues surrounding autonomous driving. It then further examines the current problems with autonomous driving technology and includes the negative impact of the Tesla brake failure on the autonomous driving industry. Finally, the form of fees charged by the self-driving industry is analyzed by investigating the fees charged by different self-driving car brands.

3. PESTLE Analysis

3.1 Political

In recent years, automatic driving has become a hot topic, which has aroused the supervision of various countries, and the United Nations also issued relevant laws -*Vienna Convention* in 2016 to recognize the legal status of automatic driving. At the same time, the two world powers, China and the United States, have also issued relevant regulations, as shown in Table 1 and Table 2.

Table 1. China's relevant laws on automatic driving have been issued and outlined in recent years [15].

Time	Law	Outline
April 2018	<i>Test specification for automatic driving function of intelligent connected vehicle</i>	14 automatic driving functions and 34 scenarios are specified.
February 24, 2020	<i>Innovation and development strategy of intelligent vehicle</i>	By 2025, the relevant system of China's standard intelligent vehicles will be basically formed.
March 9th	<i>Public document of automobile driving automation classification</i>	The driving automation is divided into 0-5 levels.

Table 2. The United States' relevant laws on automatic driving have been issued and outlined in recent years [15].

Time	Law	Outline
July 2012	<i>Autopilot bill (316th and 319th chapter of traffic management law)</i>	Define the responsibility of automatic driving and test conditions.
August 2016	<i>act 218</i>	Automatic driving technology is defined for the highway regulation act.
September 20, 2016	<i>Federal auto-driving policy guide</i>	Emphasizing safety as the first criterion, ¹⁵ Safety specifications are proposed for the design and development of autopilot.
2020	<i>The latest auto-driving vehicle guidelines 4 (AV4.0)</i>	Established the leading position of automatic driving in the United States and clarified the ten principles of automatic driving.

From the above table, by observing the year of the promulgation of relevant laws and regulations on automatic driving, it is not difficult to find that in recent years, both the United States, China, and even the United Nations are constantly improving and introducing relevant laws and regulations on automatic driving. However, as autonomous driving is still a relatively new industry, we can see that in terms of the definition of automatic driving, China did not release the public document "classification of automobile driving automation" until March 9, 2020. It divided the driving automation into 0-5 levels, and made clear the terms, classification definition, classification principles, elements and functions of China's automobile driving automation system Division process and judgment method, and the technical requirements of each level. Similarly, the United States did not

announce the latest auto-driving vehicle Rule 4 (AV4.0) until early 2020 and clarified the ten principles of automatic driving [15].

At the same time, we can observe that the laws on automatic driving mainly focus on three aspects in recent years: 1. The safety of automatic driving; 2. How to define automatic driving, including its own division, responsibility in accidents, and so on. 3. It is related to the trial operation under the automatic driving line.

In conclusion, by observing the above table, it can find that automatic driving is in the high-tech industry in both China and the United States and occupies a leading position in the national development. Hence, the country pays more and more attention to it, and the laws and regulations are more and more perfect.

At the same time, it can also be found from the analysis that although autonomous driving is a hot topic at present, its law is still in the stage of just beginning to be established. Therefore, many aspects of the law have not been improved. With the landing of autonomous vehicles, the imperfection of the law will cause many problems in the follow-up. Therefore, we hope that the state, society and individuals can pay more attention to automatic driving, introduce more relevant laws and regulations, and further improve the laws of automatic driving to make them more comprehensive and strict, so as to ensure the subsequent safety.

3.2 Economic

It is a common trend that people around the world are earning more and more every year. It also means that people have more money to spend on all kinds of electronics, including automatic cars. However, the global outbreak of the New Crown virus in 2019 is certainly a huge blow to the autonomous driving industry. The global recession, rising unemployment, and a drop in purchasing power during the outbreak. These factors have largely reduced sales for automotive companies. At the same time, many businesses closed, and many people were restricted from leaving their homes due to the need for quarantine in the face of the epidemic. Automotive parts suppliers worldwide were faced with requests to quarantine or even shut down their production lines completely. The reduced demand for automatic cars during the epidemic and the reduced supply has undoubtedly taken a huge toll on the development of the automatic drive industry. However, as the epidemic recovered, the economy of the automatic industry gradually recovered. So autopilot companies can choose to expand their production lines in countries where the outbreak is less severe. In areas where the outbreak is severe reduce production or switch to respirators thus helping to combat the new coronavirus. Wait until the epidemic has recovered before starting production of automated vehicles.

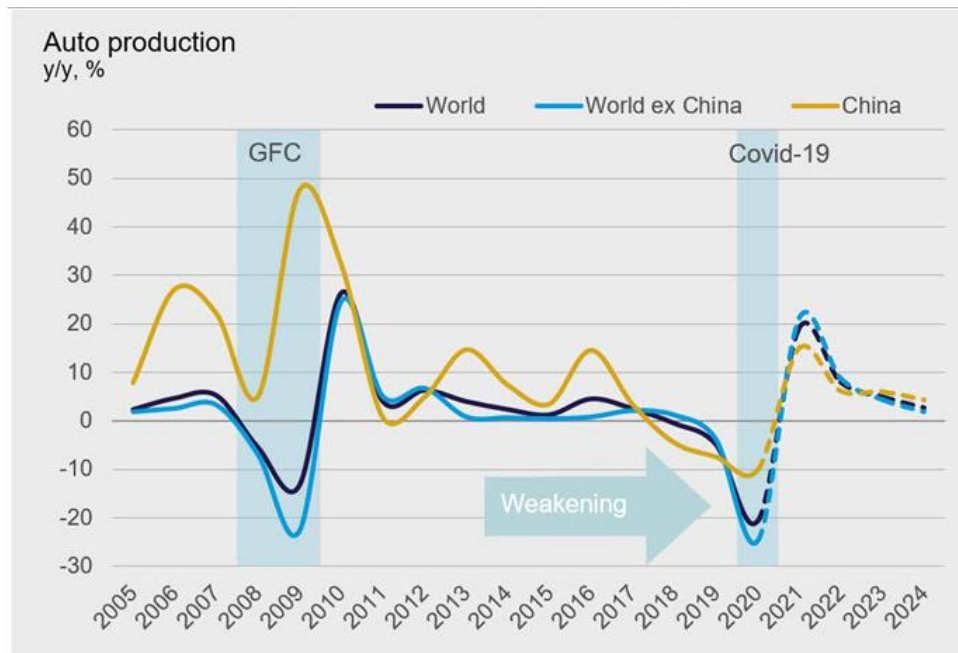


Figure 1. The auto industry suffers from its already weak footing [16]

3.3 Social

There is no denying that automatic cars bring a lot of convenience to society. Firstly, there is no need for consumers to go through the difficult process of getting a driving license. Secondly, with automatic cars, the elderly, disabled, and color-blind will not have to deal with the inconvenience of travelling, which will also contribute to the further development of social welfare. At the same time, automatic cars will improve the efficiency of navigation and traffic congestion, as they will be able to monitor road conditions in real time via satellite navigation and plan optimal routes. However, there are still many people in society who are resistant to automatic cars. This is especially true after the recent Tesla brake failure accident, which could have a huge impact on the automatic industry and deter more and more consumers from buying automatic cars. But disruptive technologies such as automatic cars are bound to be opposed and blocked by those who benefit from traditional models. So, autopilot companies can choose to expand their production lines in countries where the outbreak is less severe. In areas where the outbreak is severe reduce production or switch to respirators thus helping to combat the new coronavirus. Wait until the epidemic has recovered before starting production of automated vehicles.

3.4 Technology

At present, on the technical level, companies at the forefront of automatic driving technology have started the trial operation of L4 level automatic driving vehicles. Still, until now, no company has realized the promotion of L4 level automatic driving vehicles. In other words, automatic driving technology is not very mature and has not been commercialized on a large scale.

When it comes to automatic driving, it mainly involves five technologies: identification technology, decision-making technology, positioning technology, communication security technology, and human-computer interaction technology. Here I mainly discuss the different technologies used in the current recognition technology.

Table 3. Advantages and disadvantages of different technologies used in identification technology [17].

Performance	Lidar	Millimeter-wave radar	Ultrasonic radar	Camera	Infrared
Cost	High	Medium	Low	Medium	Medium
Detection angle	15-360°	10-70°	120°	30°	30°
Remote detection	Strong	Weak	Weak	Weak	Commonly
Night environment	Strong	Strong	Strong	Weak	Strong
All-weather	Weak	Strong	Weak	Weak	Weak
Adverse weather environment	Weak	Strong	Commonly	Weak	Weak
Temperature stability	Strong	Strong	Weak	Strong	Commonly
Speed measurement capability	Weak	Strong	Commonly	Weak	Commonly
Road sign recognition	×	×	×	√	×

The above chart shows the different performances of different technologies used for automatic driving recognition technology. Among them, the most commonly used is the camera because it is closest to the naked eye, can identify colors, objects. But the disadvantage is that it cannot accurately identify the environment at night and in bad weather, and the distance factor greatly influences it. Secondly, lidar is a very controversial technology. Many enterprises adopt lidar because it can draw a 3D map of peripheral obstacles through the reflection time and wavelength of the laser beam, but it can't recognize image and color [17].

The third is millimeter-wave radar, which can work all-weather and can penetrate dust, rain, and snow, so it is more popular. Still, its disadvantage is that it cannot identify the height, low resolution, difficult to image [17].

The above discussion indicates that each technology has its own advantages and disadvantages. Therefore, a new topic called sensor fusion has emerged in the automatic driving industry. Its ideal state is to comprehensively evaluate the accuracy of information according to the advantages and disadvantages of each sensor to get a more reliable final result. At the same time, when a sensor fails, it can also use other sensors to judge the road effectively.

Generally speaking, at present, the great problem of automatic driving in technology is that it has a wide range of technologies, but each technology has shortcomings that can not be ignored, and the overall technology is not mature. The technical problems can be solved mainly by reducing the wider technical research and improving a technology that is most likely to reduce defects.

3.5 Environment

Carbon dioxide is one of the most serious environmental pollutants produced by the automobile industry. It plays an important role in global climate change through the greenhouse effect. The emergence of self-driving cars can effectively plan the optimal path and reduce traffic jams. This can reduce the exhaust emissions of cars, which is a kind of environmental protection. Ultrasonic radar, cameras, millimeter wave radar and other sensing devices on self-driving cars are manufactured using biodegradable materials. This way, when the car is scrapped, it avoids causing pollution to the environment.

3.6 Legal

Copyright is a problem faced by many self-driving car companies, many of which have plagiarized. For example, plagiarism in design. In addition, intellectual property rights are a common problem in the auto industry. Automated car companies use legal means to protect their interests by applying for patents. Improve the details concerning various related laws and reduce the existence of legal

loopholes. Each company consciously complies with the relevant laws and strengthens the penalties for breaking the law. Call for public scrutiny of the company.

4. Path planning

In recent years, the most popular topics about automatic driving are sensor technology and safety performance, but the topic of path planning has gradually disappeared in people's eyes. This is mainly because, in recent years, the development of path planning has entered a bottleneck, facing the embarrassing situation of having technology but immature technology, so this topic can only be shelved. So, what kind of problems does path planning encounter? Or, in other words, what kind of bottleneck? This problem will be analyzed below.

First, what is path planning? Path planning is actually composed of an environment model and a path search algorithm. Here, the path planning will be divided into two parts according to its components, environment model and path search algorithm.

4.1 Environmental model

Generally, environment models are divided into four categories: grid method, visual graph method, free space method, and topology method. The following table describes the advantages and disadvantages of different environmental models.

Table 4. Advantages and disadvantages of different environment models [18, 19].

Method	Brief introduction	Advantages	Disadvantages
Grid method	By dividing the workspace into regular and uniform grids with binary information, we can find free grids to connect and avoid obstacles	-The most mature algorithm -The algorithm with the highest safety factor -Intuitive -Modeling is relatively easy	-The algorithm that consumes the most computing resources -If the resolution is high, the demand for computing resources and memory is high -Sensor limits (the only lidar can be used)
Visual graph method	The starting point, the target point, and the obstacle are regarded as different vertices, which are connected by lines and cannot pass through the obstacle to obtain the shortest path.	-More flexible	-The number of obstacles is directly proportional to the complexity of the algorithm. If the algorithm is too complex, its reliability will be reduced.
Free-space method	The free space is constructed by pre-defined basic shapes such as generalized cones and convex polygon, and the free space is represented as a connected graph. Path planning is carried out by searching the connected graph.	-It consumes less computing resources	-It is not suitable for a dynamic environment, and the change of movement speed should be as small as possible
Topological method	The planning space is divided into subspaces with topological characteristics, and the topological network is established according to their connectivity. The topological path from the starting point to the target point is found on the network, and finally, the geometric path is obtained from the topological path.	-Reduced search space -The complexity of the algorithm only depends on the number of obstacles -The exact position is not required	-The process of building is very complicated -The problem of how to effectively correct the existing topological network when adding obstacles has not been solved

4.2 Path searching algorithm

For the path search algorithm, its classification is very complex, such as Dijkstra, Floyd Warshall, a + algorithm, hierarchy, action behavior method, etc. It should be pointed out that most algorithms were born in the 1960s. However, the above is only a 2D-level path search algorithm, and the 3D level will be more complex.

This paper first discusses the Dijkstra algorithm, one of the most classical algorithms, which E.W. Dijkstra proposed in 1959. The optimal global path can be obtained by calculating the shortest distance from the initial point to any point in the free space. The algorithm starts from the initial point to calculate the distance between 4 or 8 points and the initial point. It then takes the point with the new calculation distance as the calculation point to calculate the distance between the surrounding point and the initial point, to calculate the propagation in free space like a wave front until it reaches the target point, to calculate the shortest path. Therefore, this algorithm is good at clear thinking and accurate search. But it will also greatly increase the calculation time and the amount of data, so it is time-consuming and takes up a lot of space [19, 20].

But why is the Dijkstra algorithm regarded as one of the most classic algorithms instead of the only one? Because the efficiency and scope of application of different algorithms are different, high efficiency and wide range of problem-solving do not necessarily mean wide application, so they cannot replace each other, so there are still many algorithms.

The following figure simply compares the five algorithms in search direction, heuristic, incremental, the scope of application, and practical application.

Table 5. Performance comparison of five algorithms [21].

Algorithm	Search direction	Heuristics algorithm	Incremental algorithm	Scope of application
Dijkstra	Forward search	No	No	Global information known, static planning
A*	Forward search	Yes	No	Global information known, static planning
D*	Reverse search	No	Yes	Part of the information is known, dynamic programming
LPA*	Forward search	No	Yes	Part of the information is known, and the rest is assumed to be a free path
D* lite	Reverse search	Yes	Yes	Part of the information is known, and the rest is assumed to be a free path

This table compares the performance of five algorithms and points out that the performance of different algorithms is different. High efficiency and a wide range of problem-solving do not necessarily mean wide application. Generally speaking, the current practical application of the algorithm should be inclined to give full play to the expertise of an algorithm and constantly optimize the algorithm performance based on basic functions to make a breakthrough in the aspect of automatic driving path planning.

5. Negative effects of Tesla brake failure

On 19 April 2021, on the first day of the press day at the International Motor Show in Shanghai, a woman wearing a Tesla logo with "Tesla Malfunction" was seen standing on the roof of a Tesla at the Tesla booth. The woman was so agitated that she even banged on the roof of the car. The woman shouted, 'Tesla brakes are not working'. One day later, the woman was sentenced to five days' administrative detention for disturbing public order. At the same time, the incident in which the woman stood on top of the car to defend her rights sparked a public outcry.

The investigation revealed that the owner had purchased a white Tesla in 2019. On the 21st of February 2021, the owner noticed that the car did not slow down when she applied the brakes at a traffic light and caused a rear-end collision. The lady then went on the road to defend her rights.

Many netizens have taken to the internet to voice their resistance to Tesla cars and have even developed a questioning mentality about Autopilot. Even before Tesla's brakes failed, many people were not positive about the new field of autonomous driving. Many traditional-minded people were

unable to accept the idea of having a car drive instead of a person, for fear of the lack of perfect technology would cause accidents. But most people still have expectations of autonomous driving. In the wake of this incident, more people are questioning autonomous driving. Because Tesla is a giant in autonomous driving, even a big company like Tesla has had an accident where the brakes failed, let alone other autonomous driving companies. As a result, many people with expectations of autonomous driving will lose trust in this new industry.

Some experts point out that consumers who are more hesitant about which car to buy in this wave of public opinion will still hesitate when they should. They will add an evaluation criterion of whether the brakes might be faulty. And those who like Tesla still like Tesla. It is the group of people who have not been exposed to Tesla before who are really affected, especially when there is too much negative information, who are reluctant to try and test drive the car. There is also a small group of people who do not know anything about Tesla and now simply block out its information.

Many experts and professionals in the industry also believe that there may be a bug in the Tesla software system that Tesla itself cannot detect, let alone fix. Since Tesla itself, which has the original code, could not detect it, it would be even more difficult for other organizations. This is certainly putting a lot of pressure on the self-driving industry being the manufacturer. Because precise data can also have the potential to cause errors, meaning that Autopilot cannot fully guarantee the safety of people on the road. As a result, self-driving companies need to spend more time and experience perfecting the technology.

6. Consumption Discussion

For example, in the market for self-driving cars, Tesla, Xiaopeng, and NIO are selling autonomous self-driving cars by charging a fee. Tesla's Autopilot package is available at an additional cost, currently at \$8,000 (approximately RMB 54,000) for the FSD-Full Self-Driving upgrade. The pricing will likely only appeal to Tesla's loyal fans and not to those consumers on the fence. Tesla has reintroduced a cheaper FSD package - the Enhanced Autopilot program package - for the price-sensitive crowd to reap more consumers. The upgrade package costs \$4,000 (about Rmb27,000), which is only half the current FSD upgrade package price. According to the latest public information, Tesla has launched a paid monthly service to better open up the market - a subscription service for Full Autopilot (FSD) at \$199/month (equivalent to about RMB 1,300) for new users, or about RMB 15,600 for the year. For those who have previously purchased the Tesla Enhanced Autopilot package, the price will be reduced to \$99/month. Its features include self-driving navigation, automatic lane changing; automatic parking; and summoning the car via AI. Such a convenient purchase can better attract consumers while ensuring the company makes a profit, and Tesla has arguably used a lot of methods to gain more profit. In addition, offering free self-driving systems to consumers would help the company open up the market faster and better, capitalizing on consumers' interest in autonomous driving by offering free self-driving systems so that consumers are not restricted by financial constraints, which would help the company capture market share. This will help the company to capture market share. It will also allow for collecting a large amount of valid data for future upgrades to the self-driving system. On the other hand, these companies do not yet have enough miles on their cars to be confident in offering a better autonomous driving system.

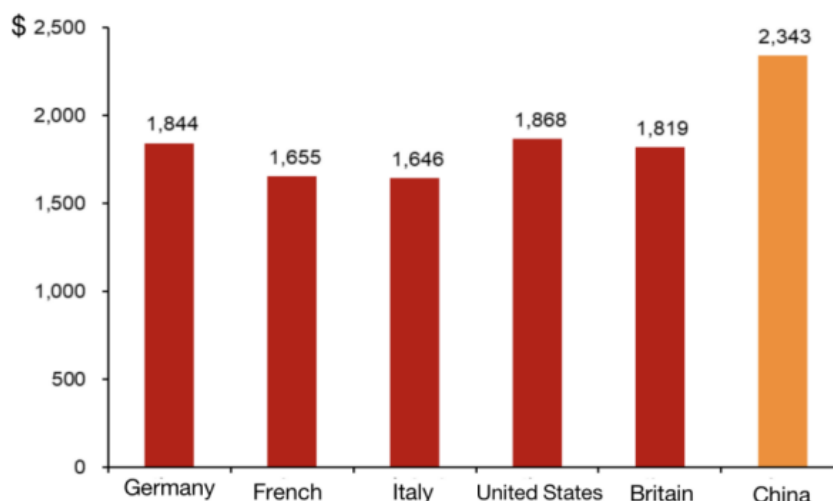


Figure 2. The additional costs consumers in various countries are willing to pay for L4

7. Conclusion

This research has examined the obstacles that autonomous driving technology is facing at this stage and the reasons for the public's current mistrust of autonomous driving, which negatively impacts self-driving car companies and the autonomous driving market. In addition, the paper discussed the differences in pricing of autonomous driving systems between the different self-driving car companies in the market. It should be concluded that, at this stage, the development of path planning in the field of autonomous driving has reached a bottleneck. This is because different algorithms and technologies are not interchangeable due to their different efficiency and applicability. And because of incidents such as the Tesla brake failure, the public is skeptical and distrustful of the maturity and safety of autonomous driving technology. In addition, self-driving car companies have adopted a variety of self-driving systems sales options, such as free systems or monthly subscriptions, to better serve consumers, which allows them to choose a self-driving service based on their needs. In conclusion, autonomous driving is a very promising market. Once the technical issues are resolved, the market for autonomous driving will open up completely and usher in a new transport system.

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