Research report (7031 AAD)

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Project title: 2030 Short-distance Delivery Vehicle

Short abstract

In 2030, imagine a scenario where delivery service system can be combined with autonomous driving technology. In the future, the combination of the two can bring more convenience to people. The purpose of this project is to design a self-driving car for short-distance delivery services, including food, daily necessities, and parcels between friends. Compared with today's manual delivery service, this smart car greatly reduces manpower and improves efficiency.

Introduction

The concept of this project was inspired by the demand in the era of online shopping. In recent years, the rapid development of the Internet has made online shopping a huge trend. The development of online shopping has brought varying degrees of impact and challenges to various industries in the society. The delivery industry is an important transportation channel for online shopping. Therefore, how to construct a delivery system in the era of online shopping has become a topic of the current logistics industry. Logistics companies should start from their own, combined with the characteristics of the era of online shopping, strengthen the construction of the command delivery system, in order to provide customers with convenient and fast services.

Secondary Research

The proposal of smart delivery system originated in 2009. It is a phased goal formed under a specific background, mainly to realize the transformation from concept to practical application, under the background of rapid development of Internet. It is mainly through integrated functional technical forms to promote the delivery system to simulate or imitate human functions, so as to ensure that the delivering process can solve related problems through thinking, perception, reasoning and other means. This means to obtain relevant information during the circulation process of related commodities. On this basis, the company can analyze it, and make decisions, so as to track and manage related goods from beginning to end. Through sensors, Positioning and other means, they can truly realize the informatization of delivery management.

With the development of modern technology, online shopping is developing rapidly. Through the search of relevant data, we can see that in China, the transaction volume of Tmall and Taobao on 'Double 11' in 2019 was as high as 70 billion yuan. Behind this figure, there is a huge logistics and information flow. In order to better realize the scientific and efficient transportation of goods, this requires the development of the logistics industry to conform to the development trend of electronic transactions. Therefore, only by continuously establishing smart logistics and improving its technical capabilities, we can obtain strong supports.

The advent and development of the era of online shopping has put forward new requirements for the construction of a smart delivery system. With the development of the era of online shopping, the increase in the number of networks, and the convenience of online shopping, more and more items are delivered to consumers through logistics, which has brought pressure and motivation to the logistics industry, and has also proposed new developments in the industry. It can be said that the development of the era of online shopping has provided era requirements for the construction of smart logistics. The development of online shopping is getting faster and faster. Many logistics companies have experienced warehouse explosions, and even some goods have been lost or damaged, causing loss to consumers, logistics companies and operators. The reason is that the construction of the logistics system has not fully kept up with the development of cargo transportation, and effective, scientific and intelligent logistics technology is needed to provide power and foundation for the development of the logistics industry. How logistics companies can improve their capabilities in the era of online shopping, how to make the goods purchased by consumers reach their hands quickly and well, how to gain a place in the fierce World Bank competition, etc., are all important issues that current logistics companies should think about and solve. problem. It can be seen that the establishment of a smart logistics system is the current economic and social demand, and it is also a necessary stage and an important link for the rapid development of the logistics industry.

The realization of smart logistics by logistics enterprises is the demand of current social and economic development. It is the integration and configuration of multiple technologies in the development process of logistics enterprises to better manage and optimize the logistics process. Therefore, the construction of smart logistics can generate more value for logistics companies.

The purpose and significance of the construction of an enterprise's smart logistics system are as follows. One is to promote more humane logistics and transportation. The emergence of online shopping forces has brought new business opportunities to logistics companies. The construction of a smart logistics system not only help goods realize simple circulation, but also realize intelligence, information and networking in the logistics management process.It also promote the humanized management of logistics and transportation. Compared with the traditional logistics industry, smart logistics has higher efficiency and better service levels. The second point is to further reduce the cost of logistics and

transportation. The establishment of smart logistics can reduce logistics management costs and logistics transportation costs through commodity informatization. The information-based network transportation mode can help logistics companies to effectively realize the distribution, transportation, and management of goods, effectively reduce the occurrence of empty truck distribution and other situations, and control the cost of the logistics industry to a large extent. The third point is to promote more standardized management of logistics enterprises. Smart logistics mainly enters product information through numbers, and provides services for consumers and operators through a unified model. As long as the relevant information is inquired, cargo information can be obtained in time, and the standardization and standardization of logistics management can be further improved. To a certain extent, it can effectively prevent the occurrence of cargo loss and damage. Not only that, through the establishment of smart logistics, high-quality services such as cash on delivery can also be realized, and goods can be delivered face-to-face according to consumer requirements.

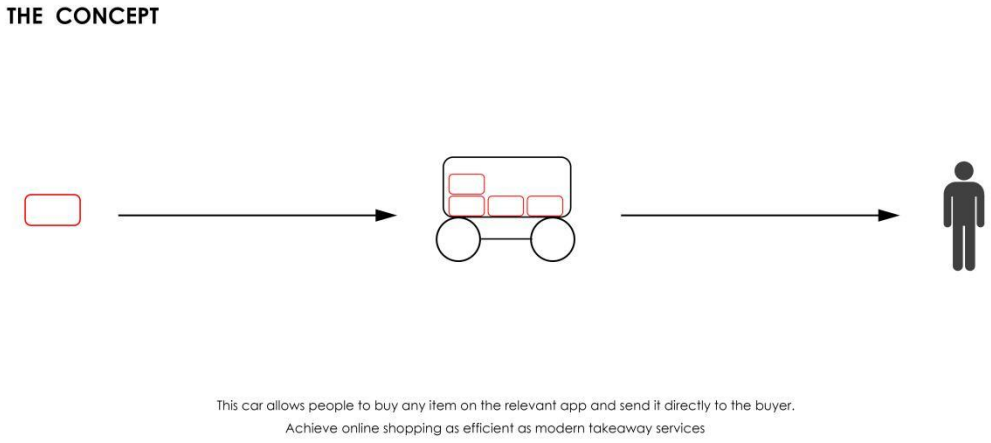
In conclusion, with the development of social economy, the era of online shopping has already come. Consumers and other groups continue to improve their logistics requirements, making it urgent for logistics companies to build smart logistics systems. With the increasingly competition in the logistics market and the deepening of the industry's development, in the process of building a smart logistics system, companies must start from their own actual conditions, improve the logistics system from multiple angles, so as to provide consumers with better services. My concept is based on these facts and future trends.

The short-haul transportation industry is an industry whose demand has rapidly increased . With the popularity of online shopping, more and more people will have more demand for short-distance fast shopping. At this stage, this type of service system mainly focus on food delivery industry. However, people's needs will not be limited to food in the near future. All kinds of daily necessities, even luxury goods, can be delivered to buyers through short-distance and fast transportation. At this stage, people usually purchase these items online through long-term transportation. For example, purchase on Amazon, Taobao and other apps. Such a transportation method has high cost and low efficiency, and the process of changing goods is relatively cumbersome. In the transportation concept designed in this project, these problems will be well resolved.

Specifically, at this stage, the short-distance fast transportation industry can only be limited to the food sector for the following reasons. Firstly, the security of the package. When manually transporting some more expensive items in a short distance, buyers will worry about the damage of the items on the way and some personal privacy issues. Second, the inconvenience to transportation personnel. If the short-distance and rapid transportation of

most items is realized at this stage, the existing manpower requirements will be far from enough, and without the support of a complete system, the transportation of completely different types of goods will lead to a significant drop in the efficiency of the transportation process.

However, with the support of autonomous driving technology and a more complete short-distance transportation system, the above problems will be well resolved. First of all, the cockpit of the vehicle of this project is composed of multiple modules. Each module space can store one piece of cargo. The seller prepares the goods, the buyer receives the goods, and the entire transportation process is more rigorous and orderly. And self-driving cars can plan the optimal transportation route by themselves, which not only saves manpower, but also improves efficiency.



According to the Market dynamics and investment prospects analysis report of the delivery industry, there are mainly four aspects which reveal the quality of the delivery service. First one is safety. Safety means that the take-out business must ensure the security of the take-out. The purpose of customers ordering takeaway is to experience different kinds of goods. If the takeaway merchants cannot meet the user's demand for product quality, then the takeaway merchants will not be able to obtain higher profits. A takeaway business that is popular with customers must have a high quality. Only by ensuring the safety, customers will take the initiative to order takeaways, and merchants can earn considerable income. The second part is fastness. In addition to the quality of the takeout, customers will also consider the delivery speed when ordering. It will affect the mood of the customer if the speed doesn’t reach the costumers’ demand, and it will not be possible for the customer to order again. A takeaway platform that can provide fast delivery services will surely be loved by customers. At this stage, the takeaway platform has two solutions to this problem. The first

aspect is to improve the delivery speed of platform distributors. The takeaway platform can link the delivery time to the delivery staff’ s salary to enhance the delivery staff’ s work enthusiasm, and at the same time impose some penalties on delivery staff who exceed the delivery time. The second aspect is to improve the delivery speed of the merchant's delivery staff. The takeaway platform can link the delivery time with the service fee paid by the merchant, charge higher service fees for the merchants who exceed the time, and let the merchant know the importance of the delivery time. The third part is personlization, which means that the delivery industry must provide personalized recommendation services, the merchants must recommend goods that users may like. In today's era, the food delivery industry is pproviding services passively which cannot bring users a good user experience. As people's needs continue to increase, there are fewer and fewer takeaway platforms that serve passively. If the delivery industry wants to meet people's modern needs, it must provide personalized recommendation services. The delivery industry should study big data technology and use it to analyze customer preferences to provide customers with alternative delivery options. At the same time, the industry should also pay attention to customers’ feedback and constantly update recommended contents. This approach is helpful to keep customers interested in buying. Finally, it comes to subjectivity, which means that the delivery industry must meet the actual needs of users and respect the dominant position of users. In today's era, users are the center of service. Whether it is a commodity or a service, it must meet the needs of the costumers. The takeaway platform, as a takeaway service provider, must provide high-quality services to users. For example, it must meet the needs of users in terms of the interface and functions of the takeaway software, and minimize the user's difficulty in using it. The interact interface of takeaway merchants has more detailed product introductions and actual pictures, providing users with a variety of choices. At the same time, they can carry out preferential activities during user consumption, thereby stimulating user consumption. The takeaway delivery staff must do their own job, and at the same time ensure the user's information security, do not casually disclose the user's identity information, and do not privately add the user's contact information, so as to bring the user a good takeaway buying experience.

Above is the requirements of the users in delivery area. This project aims to make the vehicle be able to reach the standard of future delivery demand by using self-driving technology and new interactive system.

In this section, I will explain the significance of autonomous driving for this project and the usage of it. For this project, the space of the body cockpit will be fully used for transporting goods which means that it is a L5 level autonomous driving. A major difficulty faced by autonomous vehicles that do not require human operation on the road is to realize the pilot driving function of urban complex roads. Urban roads are complex and intricate. People

never know when a motorcycle will cross the road, when a pedestrian will suddenly appear, or when a slow-moving vehicle will block the road. These highly reliant on experience without fixed rules are called ‘complex problems’ in the field of autonomous driving, and their counterparts are conventional problems. For a simple example, when a driver is halfway through the lane change, a car suddenly squeezes into driver’ s lane. Should the driver continue to change lanes and return to the original lane, or stay in the same position and slow down? It may be difficult for even the most experienced drivers to give a clear answer. For urban pilot driving, 90% of the problems faced by vehicles are routine problems, and 10% are complex problems. The key to realizing urban navigation lies in how to solve 10% of the complex problems.The number of regular questions is in ten thousand units, which can be exhausted one by one by stacking manpower and time, and setting rules manually. But the remaining 10% of the complex issues cannot theoretically be exhausted by formulating rules. From the user's point of view, it is essential to solve these 10% complex problems. It's similar to the sutuation of using a mobile phone, people won't be grateful when dial the phone 99 times, but people will be crazy when it can't dial once. These 10% of the complex problems in autonomous driving are most likely to cause user pain points and easily lead to users abandon.

In autonomous driving, the key technology to solve the above problems is data-driven algorithms. Autonomous driving algorithms, like the human brain, are responsible for important functions such as signal processing, logical analysis, and decision making. At present, there are two main types of automatic driving algorithms in the industry: rule-driven algorithms and data-driven algorithms. Currently, the most commonly used algorithm is a rule-driven algorithm. To use a simple analogy, the developer writes the basic rules of "stop at red light and go on green light" into the algorithm, so that unmanned vehicles can have the ability to respond to traffic light signals. Corresponding to the rule-driven algorithm, the input of the data-driven algorithm is the driving data of the car. For example, when dealing with a congestion scenario, engineers do not need to define specific rules for letting the car or not. Instead, the algorithm obtains the ability to cope with the congestion through self-learning based on the user's actual operation data when facing the congestion. To give a real example, in an autonomous driving test, Zhiji car encountered the other side of the vehicle while changing lanes. In the end, it responded succsessfuly. It yielded the lane to the other vehicleat first and then completed the lane change process again. This decision-making process is based on data-driven algorithms.

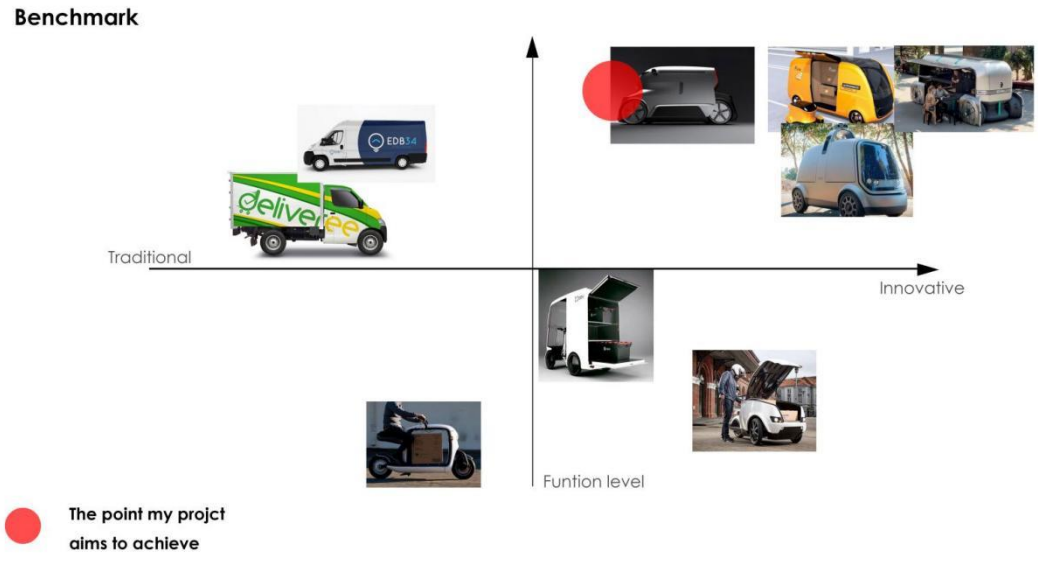
To sum up, if rule-driven is to answer a question with a standard answer, then data-driven is to answer an open proposition. Therefore, although the rule-driven algorithm has many advantages, it is still somewhat powerless. Data-driven algorithms have inherent advantages when facing these complex scenarios: The first point is that data-driven algorithms have

inherent advantages when facing these complex scenarios. The second point is high data processing efficiency. The data-driven algorithm is fully automatic for the processing of driving data, which is more efficient than traditional manual processing. Vehicles using data-driven algorithms can continuously feed back the algorithm model through real-world data, realize self-iteration and evolution, calmly respond to conventional and complex problems, and realize more complex functions such as pilot driving on urban roads.

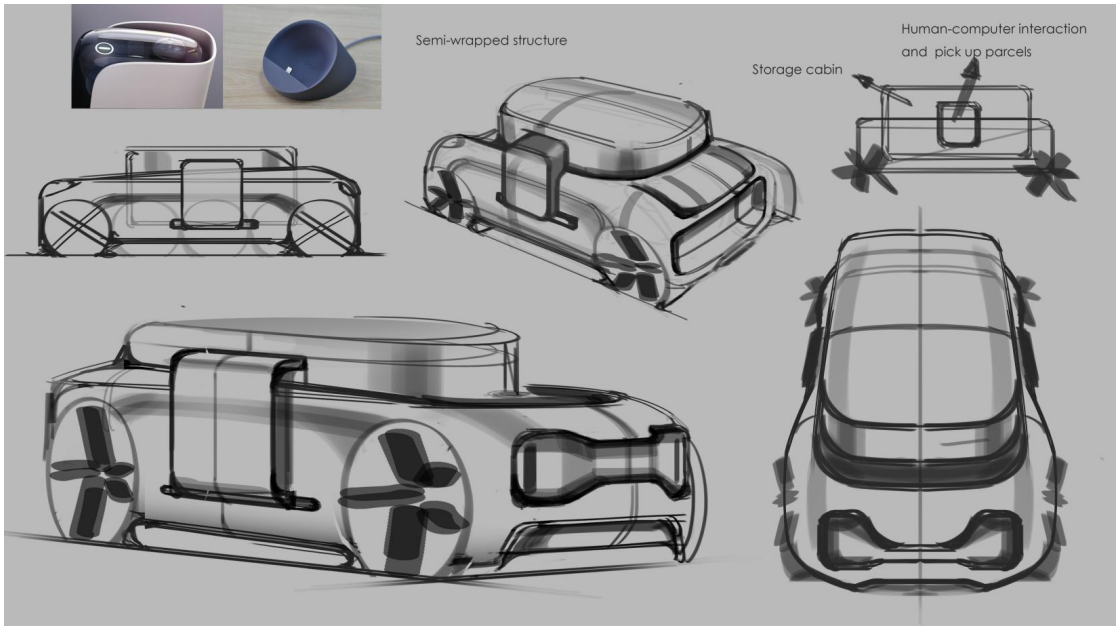
Based on the above-mentioned future technology, the vehicle can achieve at least l4 level of automatic driving. In this way, a complete short-distance fast transportation process can be realized. The process is that the buyer places an order through the app, and the merchant receives the order in time and marks the shipment time on the app. At the same time, the vehicle completes the receipt of the information and goes to the merchant, the merchant puts the goods in the vehicle and input the delivery information. The vehicle will intelligently arrange different situations, and use algorithms to find out the most efficient delivery route.

DESIGN

In this section, it will comes to the design period. At the beginning of the design, I analyzed the existing vehicles with similar functions on the market. They can be roughly divided into two categories, traditional and future. Traditional models are mainly trucks, consisting of a front cockpit and a square cargo warehouse at the rear. Future models, such as Renault EZ pro, have a greater change in styling compared to traditional cars. In order to make better use of space, the vehicle model is similar to a rectangular parallelepiped, maximizing space for cargo. My design goal is somewhere in between. I want to maximize the capacity of the warehouse while retaining the proportion and beauty of a traditional car.

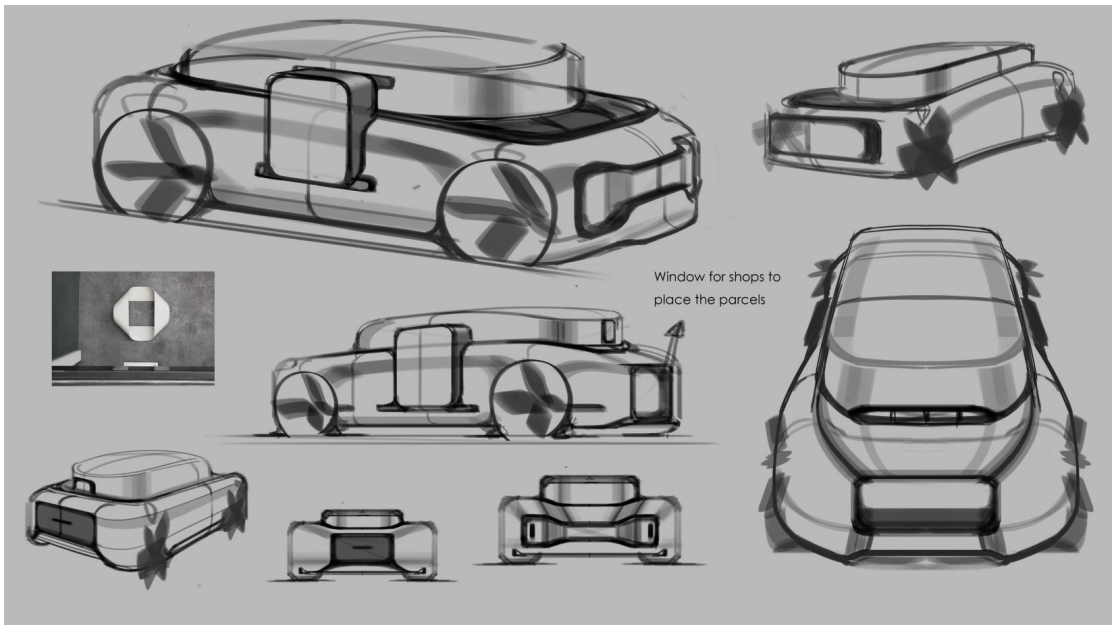


After determining the structure. I chose the model as a small car. I also determined its wheelbase and an approximate proportion. The traditional car design still retains the low front and the high rear. But I want this vehicle to be clean and stable. I think the overly obvious low front and high rear will make the car look very impactful. This is contrary to my design thinking, so I weakened this feeling. It can be seen from the intention picture that I wanted to make a semi-enclosed structure in the early stage, so that the side windows gently wrap the body. In the front shape, I tried to explore some stable and more complex structures.

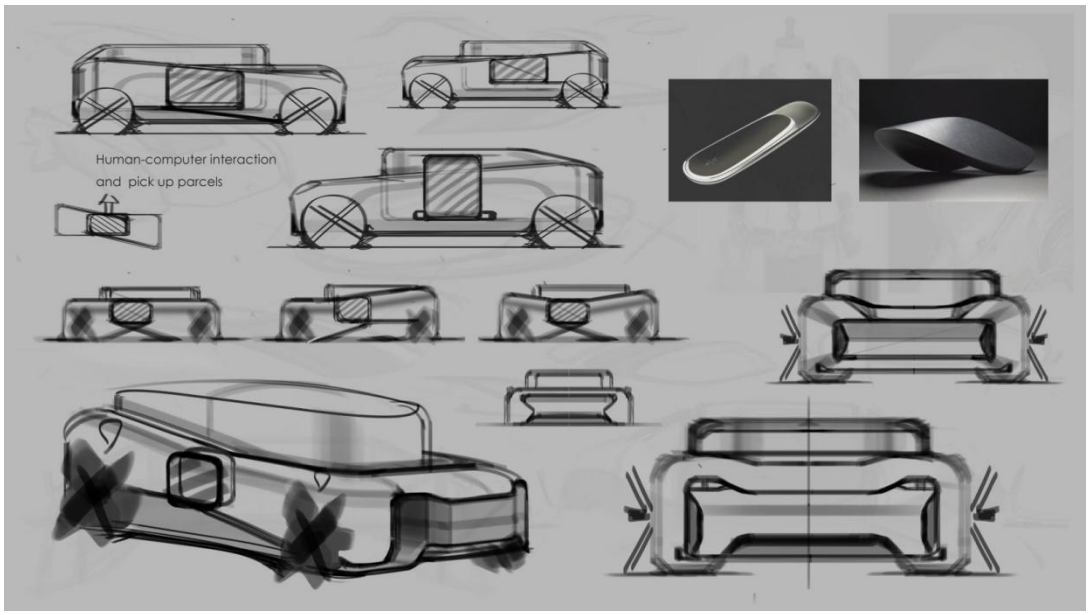


After trying some more complex structural designs of the front, I found that the overly complex structure will affect the simplicity and overall sense of the body, and to a certain extent ignore the importance of function. As a short-distance transportation vehicle, it needs to pay more attention to human-computer interaction. In terms of delivery, it needs to provide buyers and sellers with more information. For example, for the seller, the current delivery route of the vehicle, and for the buyer, the order number of the product, etc. I hope this vehicle can provide buyers and sellers with timely and accurate information very intuitively. So I added a screen design to the front for information display. At the same time, I am thinking about the way buyers and sellers ship and purchase goods, such as the design

of the purchase port at the end.



In this layout, I have some design thinking about the side window. My initial inspiration came from a simple handshake, which gave me the concept of crossover and integration. The intention picture selects two slidable components. As can be seen from my sketch, I want to divide the body into two parts, the front and the back. The place where they interact is like holding two hands together, forming a window area. At the same time, I also explored the influence of the different shapes of the front and rear parts on the proportions.



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