

Autonomous Delivery Industry Research Report, 2024

June 2024

Autonomous Delivery Research: Foundation Models Promote the Normal Application of Autonomous Delivery in Multiple Scenarios

Autonomous Delivery Industry Research Report, 2024 released by ResearchInChina combs and studies the status quo of autonomous delivery vehicles in the autonomous delivery industry, the application scenarios of autonomous delivery robots and solution providers, as well as predicts the future development trends of autonomous delivery.

1. Autonomous delivery vehicles have entered normal operation, and Jiangsu Province is at the forefront of the country.

So far, autonomous delivery has been applied to express delivery, supermarkets, autonomous retail and other scenarios. The normal application of autonomous delivery has been realized in express delivery enterprises. By region, the normal operation of autonomous delivery vehicles in express delivery enterprises was mainly concentrated in East China, North China and Northwest China during the period from early 2023 to May 2024. Specifically: East China saw the most autonomous delivery vehicles, which mainly spread in Jiangsu, Anhui and Zhejiang. By province, the ranking is Jiangsu > Anhui > Shaanxi > Zhejiang > Shanxi > Sichuan > Hebei/Beijing.



Normal Operation of Autonomous Delivery Vehicles

Official operation of autonomous delivery vehicles in Jiangsu Province Beijing and operation of such vehicles in express delivery enterprises, 2023-May 2024 Ningxia Shanxi Hebei Shaanxi Shandong Sichuan Zheijan

Normal Operation of Autonomous Delivery Vehicles in the Field of Express Delivery in China, May 2023-May 2024

Note:

1. The darker the color in the figure, the more autonomous delivery vehicles are normally operated in this area, and the more express delivery companies which use such vehicles.

2. The statistical data in the figure are about the first batch of autonomous delivery vehicles from the beginning of 2023 to May 2024 (from trial operation to formal operation) and are incomplete.

Source: ResearchInChina



Jiangsu Province has the largest number of autonomous delivery vehicles in normal operation, and Suzhou is the city with the most autonomous delivery vehicles in express delivery enterprises in Jiangsu and even the whole country. In November 2023, Jiangsu took the lead in the country to enact legislation to promote the development of Internet of Vehicles and intelligent connected vehicles: the Standing Committee of the 14th Jiangsu Provincial People's Congress approved the "Decision on Promoting the Development of Internet of Vehicles and Intelligent Connected Vehicles", which made guiding and authoritative provisions on the passage and management of autonomous driving equipment such as autonomous delivery vehicles on roads and came into effect on January 1, 2024. By April 2024, there had been 41 autonomous delivery vehicles in normal operation in Xiangcheng District of Suzhou, delivering about 14,000 parcels every day. Xiangcheng District reached in-depth cooperation with express delivery companies such as SF Express, Yunda Express and STO Express.

The following indicates the normal operation of autonomous delivery vehicles in express delivery enterprises by province:

Normal Operation of Autonomous Delivery Vehicles in Express Delivery Enterprises by Province, 2023-May 2024 (Part)



Note: The number shown in the table refers to the number of vehicles with license plates and officially hitting on the road.

Source: ResearchInChina



"Outdoor autonomous vehicles + indoor robots" can accomplish autonomous direct delivery to destinations.

2. "Outdoor autonomous vehicles + indoor robots" can accomplish autonomous direct delivery to destinations.

In June 2023, an "outdoor autonomous vehicles + indoor robots" integrated AI delivery solution was officially launched in the headquarters of China Postal Express & Logistics. The new solution can combine outdoor autonomous vehicles with different indoor robots to directly deliver goods to destinations in a variety of scenarios. For example, outdoor autonomous vehicles contact indoor robots, mailroom staff operate robots to deliver goods to destinations, users can order coffee via WeChat applets which is then delivered by robots, and robots pick up items after users place orders on the WeChat applet of EMS.

Outdoor Autonomous Vehicles Contact Indoor Robots for the Purpose of Express Delivery (Pilot)



Source: EMS



"Outdoor Autonomous Vehicles + Indoor Robots" Integrated Solution

The "outdoor autonomous vehicles + indoor robots" delivery solution mainly relies on the super chassis and super brains of outdoor autonomous vehicles to contact different indoor robots for intensive sharing, wide cooperation and real-time scheduling, while indoor robots have complete perception and cognitive functional components as well as mature positioning and navigation functional components to summon elevators with one key, open electronic doors, pass turnstiles and access Internet of Things.

"Outdoor Autonomous Vehicles + Indoor Robots" Integrated Solution

Outdoor autonomous vehicles	The "outdoor autonomous vehicles + indoor robots" delivery solution mainly relies on the super chassis and super brains of outdoor autonomous vehicles to contact different indoor robots for intensive sharing, wide cooperation and real-time scheduling
Indoor robots	 Complete perception and cognitive functional components and mature positioning and navigation functional components. Indoor robots can summon elevators with one key, open electronic doors, pass turnstiles and access Internet of Things efficiently and autonomously. They can autonomously avoid obstacles in buildings, pass through narrow spaces, cross ditches and overcome bumps. In the process of collection and delivery, robots can interact with users by SMS, telephone and other means.
Application scenarios	Logistics services for commercial buildings, high-end communities and large parks.
Higher efficiency	Compared with the traditional last-mile distribution, the efficiency is improved by more than 50%; compared with similar smart logistics, the efficiency is improved by more than 30%.

Source: ResearchInChina



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In April 2024, the WeChat applet of EMS launched the robot doorto-door delivery service. On the delivery page of the applet, there is an additional "robot door-to-door" delivery option. In large parks, universities and other places, couriers operate autonomous vehicles to transport parcels downstairs, and them indoor robots automatically "relay" them to destinations.



The WeChat applet of EMS has a "robot door-to-door" delivery option

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Autonomous delivery technology has been rapidly iterated, and BEV+Transformer perception technology has landed on vehicles.

3. Autonomous delivery technology has been rapidly iterated, and BEV+Transformer perception technology has landed on vehicles.

The algorithm structure of NEOLIX has gone through three stages, from first stage of light perception and heavy maps, to the second stage of heavy perception and light maps, and to the third stage of real-time map generation based on 4D perception of foundation models.

On the technical level of autonomous driving software, X3 Plus, Neolix's autonomous vehicle, strictly follows the underlying technical architecture logic of autonomous driving, adopts the multi-modal BEV space 4D time sequence fusion perception technology, carries Orion-X to realize pre-fusion BEV perception, and leverages the Transformer perception foundation model to process multi-sensor data of continuous time series in real time and realize zero-blind-spot, high-precision and high-robustness environmental perception.

In BEV space, time sequence fusion is carried out to form 4D space. At the same time, complex traffic flow reinforcement learning (TFRL) allows autonomous vehicles to interact with other road participants and predict their future behavior, so as to conduct better planning and control. Neolix's autonomous driving system has the capability of autonomous learning, so that it can perceive more complex obstacles, handle more complicated roads, and make autonomous delivery easy.

In other words, all the features of 2 lidars and 11 panoramic cameras are converted into the BEV space for fusion, and more comprehensive perception is fulfilled based on the fused features. This system can make full use of the advantages of each sensor, and overcome the corresponding shortcomings, so as to perform perfect perception within a range of 40m front and rear and 30m left and right, and ensure that autonomous vehicles can accurately detect objects and lane lines and recognize traffic lights, thus guaranteeing the driving safety of autonomous vehicles.



Neolix's Object Fusion Perception Solution Based on BEV



Source: Intelligent Connected Vehicle Yearbook



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