Automated/Autonomous Parking Industry

Report, 2019-2020

Apr.2020

STUDY GOAL AND OBJECTIVES

This report provides the industry executives with strategically significant competitor information, analysis, insight and projection on the competitive pattern and key companies in the industry, crucial to the development and implementation of effective business, marketing and R&D programs.

REPORT OBJECTIVES

◆ To establish a comprehensive, factual, annually updated and cost-effective information base on market size, competition patterns, market segments, goals and strategies of the leading players in the market, reviews and forecasts.

◆ To assist potential market entrants in evaluating prospective acquisition and joint venture candidates.

◆ To complement the organizations' internal competitor information gathering efforts with strategic analysis, data interpretation and insight.

◆ To suggest for concerned investors in line with the current development of this industry as well as the development tendency.

◆ To help company to succeed in a competitive market, and

METHODOLOGY

Both primary and secondary research methodologies were used in preparing this study. Initially, a comprehensive and exhaustive search of the literature on this industry was conducted. These sources included related books and journals, trade literature, marketing literature, other product/promotional literature, annual reports, security analyst reports, and other publications. Subsequently, telephone interviews or email correspondence was conducted with marketing executives etc. Other sources included related magazines, academics, and consulting companies.

INFORMATION SOURCES

The primary information sources include Company Reports, and National Bureau of Statistics of China etc.

Abstract

Why is the installation rate of automated parking not high?

Automated parking was found in 7.7 percent of passenger cars in China in 2019, according to the data from ResearchInChina.

Market Share of Automated Parking Solutions, 2019

Quarter	Ultrasonic Solution	Ultrasonic + Camera Solution
2019Q1	97.9%	2.1%
2019Q2	95.5%	4.5%
2019Q3	95.4%	4.6%
2019Q4	92.8%	7.2%

Source: ResearchInChina

As shown in the table above, most Chinese new passenger cars were pre-installed with ultrasonic solutions for automated parking in 2019; while ultrasonic + vision fusion solution only held tiny shares but saw an uptrend from the fourth quarter.

The moderate assembly rate of automated parking results from the limited scenarios of traditional ultrasonic parking solutions where the driver has to stay in the car. To tackle this problem, there are two ways: better performance of ultrasonic radars and more sensors (such as cameras and millimeter-wave radars).

For instance, the AionS Automated Parking System, which was launched by GAC in the first half of 2019, uses 12 Bosch sixth-generation ultrasonic radars to detect a longer range than the previous generation and probe objects as close as 3cm instead of the original 6cm with faster refresh and agility.

Bosch's 6th-Gen Ultrasonic Sensor

Ultrasonic sensor

Surround sensor for the calculation of distances to obstacles and to monitor space when parking and maneuvering

For comfortable and automated parking as well as for emergency braking functions at low speeds

BOSCH
Invented for life

optimum support

Basis for parking and maneuvering systems as well as automated parking

state-of-the-art

in terms of robustness, reaction time and object detection

most sensitive

ultrasonic system in the market due to very reliable object detection

- ► Benchmark in robustness against dirt, ice, environmental conditions and other ultrasonic systems
- ► Most sensitive ultrasonic system in the market (e. g. detection of low reflecting objects)
- ► Faster reaction time (first-time detection), therefore fast reaction on suddenly appearing obstacles (e. g. pedestrians, changing scenes)

TECHNICAL CHARACTERISTICS

Min. range	15 cm (Ø 7.5 cm standard pole)
Max. range	5.5 m (Ø 7.5 cm standard pole)
Object presence detection	3 – 15 cm
Detection zone	± 70° @ 35 dB horizontal field of view
Opening angles	± 35° @ 35 dB vertical field of view
Safety level	up to ASIL-B
Frequency	Frequency modulation
Membrane diameter	15.5 mm
Housing diameter	23 mm
Dimensions	44 mm (length) x 26 mm (width)
Weight	~ 14 g
Operating temperature	- 40° to + 85° C
Current consumption	≤ 500 mA (transmit mode) 7 mA (receive mode)
Protection class	IP64K

More emerging models such as Changan CS75 PLUS, Geely Xingyue, SAIC Roewe MARVEL X, Chery EXEED, etc. have embarked on ultrasonic + vision fusion parking solutions.

Rare application of ultrasonic + visual fusion solution in the past lies in lack of algorithms and powerful compute. Tesla, the pioneer going intelligent, has long resorted to ultrasonic solutions, and its automated parking capability has not performed well. Even Smart Summon launched in the second half of 2019 is not so successful, either.

Tesla's all models equipped with Autopilot 2.0 carry NVIDIA's Drive PX2 chip which supports the access to up to 6 cameras. Autopilot 2.0 cannot bolster full work of 8 cameras in the car whatever the compute or video ports. Thus, Autopilot 2.0 does not attend to the fusion of ultrasonic + vision automated parking assistant sufficiently.

According to the study by Chris Zheng, Tesla annotates the mid-range camera in the front trifocal camera at 36 frames per second, records the front fisheye camera and four side-view cameras at 9 frames per second, while it temporarily abandons the remaining front long-range camera and rear-view camera. That is to say, when Autopilot is enabled, only 6 cameras in the car are involved in labeling and perception, of which only the front mid-range camera keeps a high perception frequency while the remaining 5 cameras run strenuously with the limited computing power.

Tesla began to develop chips for strong compute. In 2019, Elon Musk unveiled the Autopilot HW 3.0 hardware upgrade powered by Tesla's self-developed FSD chip. The previous version HW2.5 uses Nvidia's Drive PX2 chip. In terms of computing power, the new chip can process about 21 times more images per second than the old one (110 frames per second), at 2,300 frames per second. If all 8 cameras are running at 36 frames per second, the whole vehicle output will be 288 frames per second, which is equivalent to 12.5% of the processing capacity of the FSD chip and is quite sufficient for automated parking.

After solving the computing power, Tesla launched "Smart Summon" at the end of 2019, which is designed to allow the car to drive to the user or an appointed place by the user, maneuvering around objects and parking as necessary. The actual tests prove that Smart Summon still does not work in many cases, indicating that the algorithm needs improvement.

In March 2020, Musk said Tesla would finish work on Autopilot core foundation codes and 3D labelling to provide better algorithms and features for its cars, and then it would unveil "Reverse Summon" soon. Reverse Summon will likely be a mirror feature to Tesla's existing "Smart Summon". Whereas Smart Summon allows the user's car to navigate from its parking space to the user, Reverse Summon likely reverses this. As such, it would conceivably entail that the user's car can drop the user off, and then navigate to a parking space on its own. To ensure safety, Smart Summon works with the Tesla mobile app when the user's phone is located within approximately 65 meters of the car with a projected top speed of 8 km/h.

Taking Tesla as a reference, OEMs and Tier1 suppliers are upgrading automated parking systems.

Desay SV told investors that its automated parking system using the vision + ultrasonic fusion solution (algorithms backed by MOMENTA) has been spawned for Chery EXEED, Geely Xing Yue and other models.

Tesla's new deep neural network will integrate all sub-neural networks including perception, path planning, and target recognition. The cooperation between Desay SV, which is adept at hardware, and MOMENTA, a veteran offer of neural network algorithms, inspires traditional Tier1 suppliers.

Valeo has long led the pack in the APA field, and its vision + ultrasonic fusion solution -- Park4U Remote has been applied to Mercedes-Benz's new S-Class sedans and Changan's new CS75 PLUS. With the powerful remote parking, Changan CS75 PLUS has been a best-seller nowadays.

To cater to the complicated parking scenarios in China, Valeo has prepared different sensor combinations for automated parking: Vision + Ultrasonic Radar Fusion Solution, and Millimeter Wave Radar + Ultrasonic Radar Fusion Solution. In 2020, a number of models using Valeo's automated parking solutions will be launched.

By launching Valeo.ai based in Paris, Valeo aims to host an open community network dedicated to the development of automotive applications in artificial intelligence and deep learning.

Souped-up compute and algorithms are not only necessary for automated parking and AVP systems, but also crucial to cockpit system, connected system, ADAS, etc. This involves changes in the vehicle's E/E architecture, super processors, domain controllers, vehicle OTA, information security, to name a few.

In the next few years, decentralized ECUs will be replaced by domain controllers whose development is often dominated by OEMs and Tier1 suppliers. The space for independent parking controllers is narrowing. For APA / AVP startups, it is of vital importance to improve algorithmic competences and have closer collaborations with Tier1 suppliers.

1 Automated Parking Concepts and Technologies

1.1 Concepts and Definition

1.1.1 Concepts of Automated Parking and Autonomous Valet Parking

1.1.2 Typical Architecture and Classification of AVP System

1.1.3 Rating and Evolution of Automated Parking

1.2 Composition and Technologies of Automatic Parking System

1.2.1 Composition

1.2.2 Fundamental Principles

1.2.3 Automated Parking System Configuration of Typical Foreign Vehicle Models

1.3 Development Trends of Automated Parking Industry

2 Automated Parking Market

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2.2 Classification and Quarterly Sales Volume of New APA-enabled Vehicle Models (by Ultrasonic and Ultrasonic + Camera)

2.3 Ranking of APA-enabled Vehicle Models in 2019 by Sales Volume (by Car Brand and Vehicle Model)

2.4 APA Solutions and Representative Vehicle Models of Major Car Brands

2.5 Installation Rate of APA by Price, 2017Q1-2019Q4

2.6 Top 30 APA Ranking by Installation Rate in 2019 (by Car Brand)

2.7 Quarterly Installation Rate of Ultrasonic APA by Price, 2017Q1-2019Q4

2.8 Quarterly Installation Rate of (Camera + Ultrasonic) APA by Price, 2017Q1-2019Q4

2.9 Quarterly Ultrasonic Radar Number of Ultrasonic APA, 2017Q1-2019Q4

2.10 APA Solution Ranking by Installation Rate in 2019 (by Car Brand)

2.11 Installation Rate of Automated Parking in Chinese Passenger Car Market, 2014-2023E

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