



**Autonomous Driving Simulation Industry
Chain Report, 2019-2020 (II)**

May 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

Autonomous Driving Simulation (II): It Turns Out to Be a Battlefield of Giants

Alibaba DAMO Academy unveiled in early 2019 the "Top Ten Technology Trends of 2019", most of which are still credible today, including two trends about autonomous driving:

Trend 1: Autonomous driving is in a cooling-off period

Only "single-car intelligence" cannot achieve absolute autonomous driving in the long run, but cooperative vehicle infrastructure system (CVIS) is gathering way to bring autonomous driving on roads in a reality. In the next two years or three, autonomous driving will be commercialized in limited scenarios such as logistics and transportation, for example, fixed-route buses, unmanned delivery, and micro-circulation in parks are just around the corner.

Trend 2: Real-time simulation of cities becomes possible, and smart cities emerge

The perceived data of urban infrastructure and the real-time data flow of cities will be pooled on a big computing platform. The advances in algorithms and computing power will facilitate the real-time fusion of unstructured information like video and other structured information. Real-time simulation of cities becomes a possibility, and local intelligence in cities will be upgraded to global intelligence. In the future, urban brain technology R&D and application will be in full swing with the involvement of more forces. Beyond the physical cities, there will be smart cities with full spatiotemporal perception, full-factor linkage and full-cycle iteration.

The development of autonomous driving industry has a direct bearing on autonomous driving simulation. The decelerating autonomous driving in the past two years is an unprecedented challenge to startups not only in autonomous driving but in autonomous driving simulation. RightHook, a sensor simulation company, has made no progress for two years; meanwhile, new autonomous driving simulation startups rarely ever came out in 2019.

On the contrary, the giants perform strikingly.

At the Shanghai Auto Show in April 2019, Huawei launched the autonomous driving cloud service Octopus (including training, simulation and testing).

In December 2019, Waymo acquired Latent Logic to strengthen its simulation technology.

In April 2020, Alibaba DAMO Academy released the "hybrid simulation test platform" for autonomous driving.

GAC believes that a virtual simulation platform was the supplement of the real vehicle test platform before, but it is indispensable to the R&D of L3 (or above) autonomous driving. At present, virtual simulation tests share more than 60% of GAC's autonomous driving R&D, a figure projected to rise to 80% in the future.

Simulation is essential for both single-car intelligence and autonomous driving R&D in CVIS route.

As autonomous driving is heading from single-car intelligence to CVIS, autonomous driving simulation has evolved from dynamics simulation, sensor simulation and road simulation (static) to traffic flow simulation (dynamic) and smart city simulation.

51VR, which has raised hundreds of millions of yuan, changed its name to 51WORLD after experiencing the VR bubble, and set about digital twin cities and autonomous driving simulation. 51WORLD signed a contract to settle in the Liangjiang New Area of Chongqing in November 2019, and will focus on expanding innovative applications of digital twin cities in Chongqing as well as autonomous driving simulation.

In fact, the combination of VR and autonomous driving simulation is not the last resort of 51WORLD. VR/AR plays a growing role in autonomous driving simulation. The technologies for building virtual scenarios are generally based on modeling software, completed games, VR / AR, and HD maps.

In August 2019, rFpro launched an autonomous driving simulation training system based on VR scenarios, featured as follows:

(1) A multitude of autonomous driving simulation operations can be fulfilled in the software.

(2) rFpro also allows the import of models from 3rd party maps, including IPG ROAD5, .max, .fbx, OpenFlight, Open Scene Graph, .obj., featured with ultra-HIDEF graphical fidelity.

Given the importance of autonomous driving simulation, the formulation of simulation standards has kicked off.

Association for Standardization of Automation and Measuring Systems (ASAM) is a global leader in autonomous driving simulation test standards (mainly OpenX Standards). Since the launch by ASAM, OpenX Standards has attracted more than 100 companies worldwide (including major automakers in Europe, America and Japan, and Tier1 suppliers) to participate in the formulation of the standards.

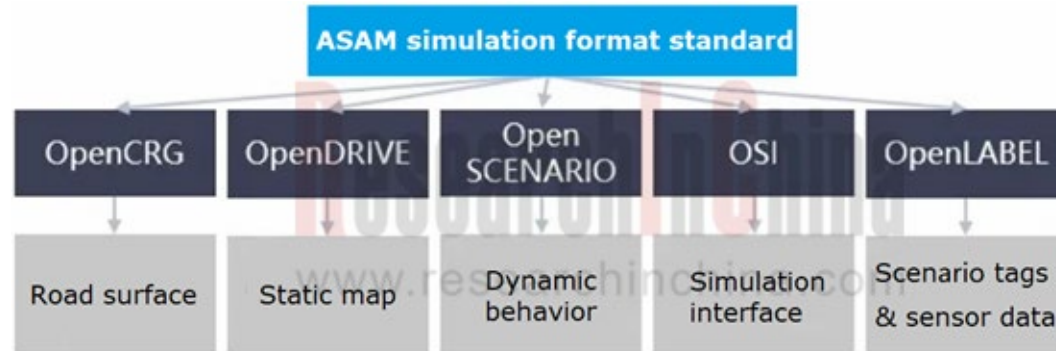
In ASAM simulation verification, OpenX Standards cover Open-DRIVE, OpenSCENARIO, Open Simulation Interface (OSI), Open-LABEL and OpenCRG.

OpenDRIVE and OpenSCENARIO unify different data formats for simulation scenarios.

OpenLABEL provides a unified calibration method for initial data and scenarios.

OSI is a generic interface that allows users to connect any sensor with a standardized interface to any automated driving function or driving simulator tool.

OpenCRG realizes the interaction between road physical information and static road scenarios.



In September 2019, China Automotive Technology & Research Center (CATARC) and ASAM jointly established the C-ASAM Working Group whose early members included Huawei, SAIC, CATARC Data Resource Center, Tencent, 51VR, Baidu, to name a few.

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