China's Preparation for the Introduction of Autonomous Vehicles

Nov. 2017
Contents

National supports of China
Autonomous driving industry in China
Chinese customers’ attitude
Summary
Smart city promote the development of autonomous driving

**Smart city is a national strategy**

- There are 6 national institutions which have published policies to plan the construction of smart city
- The state plans to develop 100 new smart cities references in 13th 5 years
- 290 cities have been identified as national pilot smart city

**Smart travel play an important role in smart city**

A smart city strategy covers six interrelated action fields where SMART TRAVEL can be a triggering and holistic solution:

- **GOVERNMENT**
- **BUILDINGS**
- **HEALTH**
- **EDUCATION**
- **ENERGY AND ENVIRONMENT**

- Smart travel needs the technical support of autonomous driving, so smart travel will inevitably drive the development of autonomous driving
China has 9 demonstration zones, 6 of those are located in the south of China, others in the north. And most of zones are located in in coastal provinces.
<table>
<thead>
<tr>
<th>Demonstration zone</th>
<th>Current progress</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>National intelligence connected vehicle(North) demonstration zone</td>
<td>Construction began in September 1, 2017</td>
<td>The only demonstration zone with natural ice road test</td>
</tr>
<tr>
<td>Liaoning Panjin BAIC autonomous experience project</td>
<td>October 2016 official operation</td>
<td>Cooperation with BAIC</td>
</tr>
<tr>
<td>Beijing &amp; Hebei Intelligent vehicle and intelligent transportation industry innovation demonstration zone</td>
<td>Release the first connected vehicle channel</td>
<td>Intelligent vehicle runs parallel to the Intelligent transportation</td>
</tr>
<tr>
<td>Shanghai National intelligence connected vehicle demonstration zone</td>
<td>The closed test area was formally operated in June 2016</td>
<td>China's first national intelligence connected vehicle demonstration zone, which is divided into four stages to form a systematic and comprehensive platform</td>
</tr>
<tr>
<td>National test base for Intelligent Transportation</td>
<td>Start project in September 10, 2017</td>
<td>An autonomous, smart town will be built to connect cars to cities</td>
</tr>
<tr>
<td>Zhejiang 5G connected vehicle application demonstration zone</td>
<td>The town of Yunxi and Wuzhen pilot has been put into use</td>
<td>Pay attention to the 5G connected vehicle</td>
</tr>
<tr>
<td>Chongqing Smart car and intelligent transportation application demonstration area</td>
<td>The first phase of &quot;intelligent vehicle integrated system test area&quot; was built and started to be used</td>
<td>Intelligent vehicle runs parallel to the Intelligent transportation</td>
</tr>
<tr>
<td>Wuhan Intelligent connected vehicle demonstration zone</td>
<td>Preparations for the first phase are in progress</td>
<td>An autonomous, smart town will be built to connect cars to cities</td>
</tr>
<tr>
<td>Shenzhen Intelligent connected vehicle demonstration zone</td>
<td>The first test car is expected to be used in third or fourth quarter of this year</td>
<td>Introducing M-CITY - The world's first autonomous vehicle test area into China</td>
</tr>
</tbody>
</table>
A NICE CITY is China’s first national intelligence connected vehicle (Shanghai Anting) pilot demonstration area, which is divided into four stages to form a systematic and comprehensive platform.

Closed test and experience area: 2016/12
Open road test area: 2017/12
Typical city test area: 2019
Model city + shared traffic corridor: 2020

A NICE CITY means that China’s intelligent networking and autonomous vehicle officially moved on to practice from the national strategic stage.

Other pilots

**Wuhan**
The capital of Hubei province opened an autonomous vehicle test zone in 2016.

**Wuhu**
In May 2016, Baidu announced a long-term partnership to work with the city of Wuhu to establish the autonomous testing zone.

**Zhangzhou**
The city of Zhangzhou, Fujian province, is planning to build the world’s largest experimental zone for autonomous driving.

**Shenzhen**
Panjin, Liaoning ...

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Autonomous Driving industry in China

Local companies fall behind in core hardware and automobile manufacture, but have advantage in algorithms, data and business model.

### Providers

Start-ups focus on autonomous driving is the focus of 2016 capital market

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<thead>
<tr>
<th>Algorithms</th>
<th>Sensors</th>
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</thead>
<tbody>
<tr>
<td>Chips</td>
<td>V2X</td>
</tr>
<tr>
<td>Data/ Map</td>
<td>Other Tier2 providers</td>
</tr>
</tbody>
</table>

Autonomous driving leads to the change of supply chain:
- More local providers have the chance to become the top Tier1 provider
- More and more Tier2 providers could connect with OEM directly

### OEMs and travel platform

<table>
<thead>
<tr>
<th>Traditional OEM</th>
</tr>
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<tbody>
<tr>
<td>FAW</td>
</tr>
<tr>
<td>SAIC</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Emerging OEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIO(蔚来)</td>
</tr>
<tr>
<td>XPENG(小鹏)</td>
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<tr>
<th>Travel platform</th>
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<tbody>
<tr>
<td>DIDI</td>
</tr>
<tr>
<td>UCAR</td>
</tr>
<tr>
<td>iZU</td>
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</tbody>
</table>

- Large use size offer high quality diversity data
- Local companies make achievements in algorithms, data and market
- Weak in core hardware of AD

+ Complicated traffic environment has great demand on AD
+ Huge market size might make China the first country commercialize autonomous driving
- Lack of automobile manufacture core technology
- Lack of top Tier1 providers
Autonomous Driving industry in China - Provider

Overview of autonomous driving provider chain in China

Solution provider

Algorithm solution

Content/Sub-provider

Sensor
- Camera
- Ultrasonic radar
- Millimeter wave radar
- LiDAR
- Inertial Navigation System
- RTK

Chip

V2X

HD map

Other provider

Some content providers try to become the solution provider, such as NavInfo (四维图新)
Case study - Algorithms

Algorithms is the major entrance of startup companies into autonomous driving market, more relevant companies emerges

Current situation:

- Startup companies lack of platform and have to cooperate with OEM to get data and the application of software
- Some startups explore new models, Tusimple (图森未来) try to do operation in driverless track; Uisee (驭势科技) push the autonomous driving solution in low speed vehicle

<table>
<thead>
<tr>
<th>Company (part)</th>
<th>Product Applications</th>
<th>Latest financing situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tusimple 图森未来 (卡车)</td>
<td>Development and application of commercial vehicle’s autonomous driving Has advantage in Algorithms</td>
<td>B+ round（2017, the amount is unknown）</td>
</tr>
<tr>
<td>Uisee 驭势科技（封闭空间低速车）</td>
<td>Solution of autonomous driving</td>
<td>A round（2016, millions of Dollars）</td>
</tr>
<tr>
<td>Momenta</td>
<td>Providing surrounding sense, HD map and autonomous driving solution algorithms</td>
<td>B round（2017, 46 million of Dollars）</td>
</tr>
</tbody>
</table>
Autonomous Driving industry in China - Sensor

China is weak in sensor industry due to the development is late, but Chinese companies invest more in R&D, localization of sensor is a trend.

Data from different sensor being extracted, processed and merged, provide the surrounding info. for system decision

<table>
<thead>
<tr>
<th>Location sensor</th>
<th>Radar sensor</th>
<th>Vision sensor</th>
<th>Attitude sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Inertial Navigation System</td>
<td>- Millimeter wave radar</td>
<td>- Monocular camera</td>
<td>- OBD</td>
</tr>
<tr>
<td>- RTK</td>
<td>- LiDAR</td>
<td>- Binocular camera</td>
<td>- CAN</td>
</tr>
<tr>
<td>- GPS</td>
<td>- Ultrasonic radar</td>
<td>- Night vision infrared</td>
<td>- IMU</td>
</tr>
</tbody>
</table>

Chinese companies fall behind in the sensor technology
- Local camera providers’ products mainly focus on ADAS, the tech. is far from the requirements of AD, local company is hard to catch up with Mobileye
- The radar is also monopolized by foreign manufacturers
+ Chinese companies invest more in sensor, it would push the localization of sensor
Autonomous Driving industry in China - OEM and platform

Autonomous driving changes the structure of automaker, more new players emerge

**Advantages and disadvantages**

**Traditional OEM**
- OEMs have advantage in fund, auto manufacture, mature sales system
- To local brands, brand influence is not that big

**Emerging OEM**
- Emerging OEMs have less constraints on innovation and Internet thinking is easy to grasp user experience
- Difficulty in auto manufacturing, promotion and sales

**Travel platform**
- Travel platform is the entrance for other service provider entering the riding scenario, have the platform advantage
- Some local brands try to transit to travel platform like Geely, it’s a challenge

New business direction, Travel and operation service have higher additional value
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Summary
Customers’ expectation of mature AD tech.

More and more Chinese customers accept mature autonomous driving than other countries.

Customers’ preference for different level of Autonomous Driving

Customers’ preference for L4 AD changes from 2014

Source: Deloitte
Customers’ preference of different companies in AD

Chinese customers prefer emerging autonomous driving technology company

Customers’ faith in different type of companies which would bring autonomous vehicles into the market

<table>
<thead>
<tr>
<th>Country</th>
<th>Traditional OEM</th>
<th>Emerging AD technology company</th>
<th>Existing technology company</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>76%</td>
<td>16%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>51%</td>
<td>26%</td>
<td>20%</td>
<td>3%</td>
</tr>
<tr>
<td>America</td>
<td>47%</td>
<td>27%</td>
<td>20%</td>
<td>6%</td>
</tr>
<tr>
<td>South Korea</td>
<td>44%</td>
<td>48%</td>
<td>7%</td>
<td>1%</td>
</tr>
<tr>
<td>India</td>
<td>34%</td>
<td>29%</td>
<td>36%</td>
<td>1%</td>
</tr>
<tr>
<td>China</td>
<td>27%</td>
<td>58%</td>
<td>15%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Source: Deloitte
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Summary
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➢ Autonomous Driving helps to Intelligent transportation system, to the national strategy Smart City, Autonomous Driving is essential

➢ Local companies are weak in core hardware of Autonomous Driving, but achieve some good results and advantages in algorithms, data and business model

➢ Start-ups focus on autonomous driving is the focus of 2016 capital market

➢ Added value of Autonomous Driving leads to the change of business model: OEM transit to travel platform service, and technology company layout in both R&D and service

➢ Chinese customers have the deepest passion in mature Autonomous Driving, it’s good for the market confidence