Digital map content, navigation, LBS solutions and traffic big data applications

Director of Joint Laboratory for Future Transport and Urban Computing of AutoNavi
Senior Analysis Specialist of Alibaba
Yuelong Su Ph.D.
AMAP: the 1st enterprises that successfully transformed from geographic information to mobile internet

**2002-2004**
- Own three first-class mapping qualification
- AutoNavi enterprises established
- Gained first-class mapping qualification of digital navigation map.

**2005-2009**
- Country's leading traditional map maker
- Establish the high-end digital map database covering the whole China
- Publish the first vehicle traffic information service system in China
- Focus map data production for 16 years
- Company staff exceeded 2000

**2010-Now**
- The first successful map enterprise to mobile internet market
- AutoNavi mobile navigation application was free to public
- Take over by Alibaba Group, marking a successful transformation for AutoNavi
- Declared patent over 900 pieces
Easy Travel Platform
One-stop public travel service

Highway Congestion Reduction
Navigation dispatch reduces highway congestion, smoothing festival traveling
Disaster relief map and ponding map makes traveling warmer

Vehicle
Sensing real-world driverless car in all dimension
1st commercial application of high-precision map facing driverless car scenario in Asia-Pacific
Alibaba car operation system AliOS with amount of vehicle installed far beyond Tesla

City Brain
Linking real world and all city applications

Smart Cone
1st road safety IoT (Internet of Things) hardware product in the whole world

Smart Highway
Incisively, comprehensively, precisely and real-time sensing people, vehicles, roads and environment

Imperceptible Payment
New experience traveling by bus or metro
AMAP

Standard Configuration for Users

MAU (Monthly Active Users) 400+ Millions

Standard Configuration for Automobiles

IoV (Internet of Vehicles) online ratio > 90%

Standard Configuration for Transport Industry

Cooperation with traffic control departments in 150+ cities

Standard Configuration for Scenic Areas

Cooperation with Ministry of Culture and Tourism, covering all 5A and > 70% 4A scenic areas

Standard Configuration for Mobile Applications

Serving 300+ thousands mobile applications, covering > 80% mainstream applications
Spatial-Temporal Data Collection, Storage, Analysis and Application System Based on People-Geography Features

**Private Cloud**

By innovation integration, data is converted into information that guides all travel activities, and then by using information, people, vehicles and roads are reconstructed, creating value for society!

- Orderly Trip
- Safe Trip
- Smooth Trip
- Convenient Trip

**Data Application**

- Traffic Information Service Based on Multivariate Data Fusion
- Road Traffic Safety Delicacy Management Based on Spatial-Temporal Data
- Urban Traffic Status and Trends Analysis Realization from Multidimensional View
- Public Benefit & Information Services Based on People-Geography Features

**Spatial-temporal Data Core Applications**

- AI* Navigation Route Planning
- AI* Travel Time Prediction
- AI* Dynamic Traffic Guidance
- AI* Congestion Delay Index

**Data Analysis**

- Distributive Storage
- High-efficient Calling
- Interface Encapsulation
- Quality Management

**Data Storage**

- Safe & reliable
- Timely & Accurate
- Complete System
- Regular & Usable

**Data Collection**

- People-Geography Featured Spatial-Temporal Big Data Crowdsourcing Collection Mode
- Dynamic Event Collection Based on High-Quality Data Flow
- Commercial Application of High-Precision Map Collection Technology

**Public Cloud**

- AMAP APP (standard configuration for users)
- AMAP vehicle version (standard configuration for vehicles)
- Smart Phone APP (standard configuration for applications)
- ET Urban Brain (standard configuration for management)
Management as a service

Right Brain (TO C)
Urban smart travel solution
- Risky road information publish
- Intelligent route guidance publish
- Real-time public transport information publish
- Aid realizing defensive driving

Left Brain (TO G)
Urban traffic governance solution
- Road traffic safety
- City feature analysis
- Public transport network optimization

Management 
Goal 
Closed Loop 
Service
Traveler intelligent scheduling and dispatch combining left brain with right brain.

- **Congestion Road**
- **Traffic Flow Road**

**Re-distribution**

**City Traffic Brain** (TO G)

**AMAP APP** (TO C)

- **Guidance Information**
- **Publication by AMAP in First Recommend Order**

**Smart thinking for good journey**
Traveler intelligent scheduling and dispatch combining left brain with right brain

Comparing the last year National Day holiday, average speed of the road had increased 30%, and travel time decrease 35%.
Share Diseconomy: Impact of Ride-Sharing Companies’ Subsidy War on Urban Congestion

From 21st, Mar to 5th, Apr 2018, a subsidy war was started in Shanghai by two ridesharing companies, forming a natural experiment on how subsidy war would impact urban congestion. Data from 99 major cities covering 72 days is carefully examined.

$$CDI = \frac{V_f}{V_c} = \frac{T_c}{T_f}$$

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent Variables</th>
<th>Control Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestion Delay Index</td>
<td>Whether is in Subsidy War</td>
<td>Weather, Population, Car Ownership, GDP and so on</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Models</th>
<th>CDI Changes</th>
<th>Equivalent Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Speed</td>
<td>Time</td>
</tr>
<tr>
<td>DID</td>
<td>0.077</td>
<td>-4.40%</td>
</tr>
<tr>
<td>PSM-DID</td>
<td>0.075</td>
<td>-5.14%</td>
</tr>
<tr>
<td>DDD</td>
<td>0.068</td>
<td>-3.51%</td>
</tr>
</tbody>
</table>

Result shows that subsidy war intensified urban congestion status, quantifying as approximately 4% time growth.

This article will be presented at TSTE 2018, an international academic conference.
The effect of limitation policies comparison in some cities in 2017

In terms of the traffic restrictions based on the last digit of license plate numbers, Xian held the best effect, Chengdu was the least.

The odd-and-even number limitation policies for Dalian shows the most evident and largest decrease on congestion, but the effect for Yinchuan was quite weak.
The city with the highest time cost in 2017 - Hongkong

- The time cost due to congestion was as high as 15890 yuan in Hongkong in 2017

<table>
<thead>
<tr>
<th>City</th>
<th>Time costs caused by congestion in 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hongkong</td>
<td>15,890</td>
</tr>
<tr>
<td>Beijing</td>
<td>11,747</td>
</tr>
<tr>
<td>Guangzhou</td>
<td>10,501</td>
</tr>
<tr>
<td>Nanjing</td>
<td>9,738</td>
</tr>
<tr>
<td>Shenzhen</td>
<td>9,624</td>
</tr>
<tr>
<td>Shanghai</td>
<td>9,122</td>
</tr>
<tr>
<td>Dalian</td>
<td>8,606</td>
</tr>
<tr>
<td>Harbin</td>
<td>8,511</td>
</tr>
<tr>
<td>Jinan</td>
<td>8,259</td>
</tr>
<tr>
<td>Chongqing</td>
<td>8,212</td>
</tr>
</tbody>
</table>

Note: Taking Beijing as an example, during peak hours, for every hour spending on journey, about 30 minutes was wasted on congestion. The average monthly salary for Beijing was 7706 yuan (According to the latest published figure from certain government department), and after converting the figure to the unit of hour, the result was 43.78 yuan (7702 ÷ 22 ÷ 8.22 means working days for every month and 8 means 8 working hours per day). So, the time costs caused by congestion was actually 21.89 yuan in Beijing in 2017.
Cross-City Commuting

➢ Cross-city Commuting Distribution of working and living: Most cross-city commuters are living in the east part of Beijing (Yanjiao, Langfang) and working in the areas of core area.

Heat-map for Beijing commuters going to Beijing outskirts

Heat-map for commuters going from Beijing outskirts to inner Beijing

Yellow point: Origin / Red point: Destination
The correlation between urban congestion and GDP is weak. Well developed region Yangtze River Delta has the lowest congestion degree.

Comparing Cheng-Yu Area, Guangdong-Hongkong-Macao Greater Bay Area, Beijing-Tianjin-Hebei Region and Yangtze River Delta, the four major economic zones in China:

➢ Cheng-Yu Area has the lowest GDP but suffers from congestion the most.
➢ In contrast, with relevantly better developed economy, the congestion degree in Yangtze River Delta is lower.

<table>
<thead>
<tr>
<th>City</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hongkong</td>
<td>1</td>
</tr>
<tr>
<td>Shenzhen</td>
<td>2</td>
</tr>
<tr>
<td>Tianjin</td>
<td>3</td>
</tr>
<tr>
<td>Suzhou</td>
<td>4</td>
</tr>
<tr>
<td>Wuhan</td>
<td>5</td>
</tr>
<tr>
<td>Hangzhou</td>
<td>6</td>
</tr>
<tr>
<td>Tsingtao</td>
<td>7</td>
</tr>
<tr>
<td>Wuxi</td>
<td>8</td>
</tr>
<tr>
<td>Changsha</td>
<td>9</td>
</tr>
<tr>
<td>Ningbo</td>
<td>10</td>
</tr>
</tbody>
</table>
Urban Traffic Analysis Report: Authoritative Information

http://report.amap.com/index.do
Discover Industrial Variable for Future Transportation

Industrial Variable Discovery for Future Transportation

Urban Brain
Intelligent Driving
Urban CT
...

Industry

Data Plug Base
Easy Travel Platform
Traffic Brain
...

AMAP

Technological Infrastructure for Traveling Industry

Scientific Research Infrastructure for Future Transportation

Lab

Big Data
Cloud Computing
Artificial Intelligence
...

Smart thinking for good journey
Joint Laboratory for Future Transport and Urban computing

Responsibility of Joint Laboratory for Future Transport and Urban Computing

1. Integration of innovation and application
2. Integration of society and talent
3. Integration of present and future

Establishment of Joint Laboratory for Future Transport and Urban Computing

Research targets five cutting edge projects (intelligent driving management, Urban "CT", Smart transportation, urban traffic brain, transportation demand management) insisting 10-year investments, collaborating with hundreds of top universities, and training millions of specialist related to future traffic development.
Make the Real World Connected, Make a Better Mobility