1. Stage of Shenzhen

The City of Shenzhen

Founded in 1979, China's first and one of the most successful Special Economic Zone. Covers an area of 1,997 km² with a total population of over 18 million in 2015.
What happened in Shenzhen in 30 years?

Shenzhen

Special Economic Zone Area 327.5km

What happened in Shenzhen in 30 years?

Shenzhen

Construction land area: 940km² (2015)
Information-based Development History of Shenzhen

Represented by land planning sector
Construction by each sector themselves

The first in China to establish the geodatabase covering the whole city.

In 1979, paper topographic map
In 1995, digital topographic map
In 1997, full coverage of the topographic maps
In 2000, remote sensing digital image
In 2006, remote sensing image dynamic monitoring
In 2007, Internet e-map
In 2008, general survey of buildings
In 2009, completed establishing geospatial platform
In 2010, top-level design of the smart city of Shenzhen
In 2012, established the benchmark city of a new type smart city
In 2016, mobile phone signaling
In 2013, 3D full coverage
In 2015, national geoinformation survey
In 2016, mobile phone signaling

Cloud service

Online service

Offline service

Digital surveying & mapping

The rise of Shenzhen Geospatial Information Platform
Development History of the Geospatial Information Platform

the platform has successfully served nearly 90 departments

2. Applications
Application of Geospatial Information Platform

开拓 Exploit

‘Exploit’ is a key word in ‘Shenzhen spirit’ in 1990.
Surveying and mapping data service in the exploration age

The dynamic surveying of the topographic map and remote sensing image covering the whole city strongly support the rapid development of Shenzhen.

Application of Geospatial Information Platform

Exploit  Pioneer  Livable  Innovation
Urban design in the pioneer city idea

Master planning + Urban design —— urban morphology
strengthened urban design, and improved urban quality.

Figure: Shenzhen Bay Coastal Leisure Strip Landscape Design International Consultation

Pioneer
Urban design simulation: Visibility analysis
Application of Geospatial Information Platform

Exploit  Pioneer  Livable  Innovation

Urban Problems

Environmental pollution  Traffic jam

Illegal construction  Population expansion
宜居城市的愿景 Vision of a Livable City

Homeland of Shenzhen
— An interesting, livable, eco-civilized, in harmony with nature city

宜居 Livable

数字环保 Digital environmental protection

Analysis of causes forecasting and early warning
Environmental impact assessment
Determine parameters by mathematical model
Dynamic monitoring of pollution sources
Sensors of the Internet of Things

Water quality assessment results
Position of the pollution source

Environmental Geographic Information Platform of Shenzhen
By monitoring and control of environmental protection, from 2007 to 2012, Shenzhen reduced 250,000 tons of PM2.5 per year, and in 2014 only, reduced PM2.5 by 77%.

Environmental Geographic Information Platform of Shenzhen

宜居 Livable
数字环保 Digital environmental protection

宜居 Livable
智能交通 Intelligent Transportation

Transportation management and emergency simulation decision-making support system

Traffic Command System
Public Travel Information Service System

Shenzhen Intelligent Transportation Platform

Switching network / Data exchange platform / Data center / GIS-T Platform

Integrated monitoring system of traffic

Transportation management system
宜居 Livable

The smoothest city with a population of tens of millions people among the 98 cities in China—“Xinhua News Agency & Didi Chuxing Report of 2015”.

Traffic Application System

Road traffic operating index system

Signal intersection dynamic assessment system

Road traffic emission monitoring system

Smart parking management and guidance system

宜居 Livable

土地监察 Land Supervision

Viewing from the sky, Probing by videos, Reporting by people, Managing on line
宜居 Livable

社会治理 Social Governance
Proactive service for specific group

Analysis of big data of residents

Resident group

According to personal feature labels, analyze specific groups by using big data technology, such as the disabled, the elderly, the veterans.

Accurate positioning
Accurate service
Meticulous help

Medical treatment for the disabled, education aid, Placement of the veterans Allowance for the elderly ...... ...

宜居 Livable

Application of Geospatial Information Platform

Exploit Pioneer Livable Innovation
Innovation

Vigorous, inclusive, international innovative city

Intelligent urban planning

- Ecological environment problem diagnosis
- Diagnosis of urban and rural social contradiction
- Planners coordinating in compilation
- Analysis and processing of urban data
- Approval and submission for approval of planning scheme

Simulation and assessment of planning scheme
Forecasting and analysis of urban development
Orderly governance of urban problems
On-line publishing Public engagement
Dynamic assessment of plan implementation

Intelligent planning

Scientific nature  Accuracy  Shareability  Dynamics
**Innovation**

### Innovation

#### Information Island Mode — Cloud Mode

- Core Team
  - Planning Institute
- University Team
  - PKU
  - WHU
  - SZU
- Social Team
  - Crowd
  - Expert

Support Online

**DATA**

- Geospatial data
- Mobile Location
- Social data

**Method**

**Urban Planning Cloud**

### Innovation

#### Static data — Dynamic data

- **Static**
  - Demand
  - Tradition Data

- **Dynamic**
  - Calculable-Decision
  - Big Data

**Big data**

- Approximate full samples, full-time, and spatial information
- Meet the needs!
- Most complete and direct record of residents' spatial activities
- Other data sources cannot reply to complicated residents' behavior
- Conduct research and planning of urban space from bottom up through residents' behaviors
**Innovation**

**Advantages of mobile phone big signaling**

- Objectivity: Full samples
- Continuity: Real time and dynamic
- Precision: No group differences

**Innovation**

- Identification time frame at night
- Identification time frame in the daytime
- Frequency and number of days
- Duration of stay

Identify the permanent residence at night and the working ground in the daytime of each mobile phone individual
Shenzhen was divided into 981 Traffic zones.

- Daily population
- Resident population
- Overnight population
- Permanent population
- Working population
- Floating population
- Respiratory population

Resident population of Shenzhen City 16.73 million

<table>
<thead>
<tr>
<th>Rank</th>
<th>Administrative Districts</th>
<th>Resident population (10 thousand people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bao’an District</td>
<td>396</td>
</tr>
<tr>
<td>2</td>
<td>Longgang District</td>
<td>366</td>
</tr>
<tr>
<td>3</td>
<td>Longhua New District</td>
<td>232</td>
</tr>
<tr>
<td>4</td>
<td>Nanshan District</td>
<td>193</td>
</tr>
<tr>
<td>5</td>
<td>Futian District</td>
<td>188</td>
</tr>
</tbody>
</table>
Dynamic population/Maximum population all day long

All kinds of demographic interpretation and application significance

Featured Day Dynamic Population Change (Shenzhen)

Innovation

population density distribution

0 (People per square kilometer) 20000
2017/5/23

Inter-zone commuters OD

- < 50
- 50 - 500
- 500 - 1000
- 1000 - 1500
- 1500 - 2000
- 2000 - 2500
- 2500 - 3000
- 3000 - 4000
- 4000 - 5000
- 5000 - 6000
- 6000 - 7000
- > 7000

Commuting passenger flow volume between traffic zones 14.01 million person times

Innovation

Administrative commuters OD

- < 5000
- 5000 - 10000
- 10000 - 30000
- 30000 - 50000
- 50000 - 70000
- 70000 - 90000
- 90000 - 150000
- 150000 - 200000
- 200000 - 300000
- > 300000

Commuting passenger flow volume between administrative regions 2.82 million person times

Dongguan Huizhou

Hong Kong

创新 Innovation
Analysis of passenger flows over road segments in the city proper

Number of people entering Meilin Border Checkpoint 350,000
Number of people entering Meilin BorderCheckpoint 340,000

Source of passenger flow volume (person-times)
- < 166
- 166 - 507
- 507 - 1109
- 1109 - 1726
- 1726 - 2477
- 2477 - 3465
- 3465 - 5557
- 5557 - 8896
- 8896 - 14369
- > 14369

Passenger flow outgoing (person-times)
- < 166
- 166 - 507
- 507 - 1109
- 1109 - 1726
- 1726 - 2477
- 2477 - 3465
- 3465 - 5557
- 5557 - 8896
- 8896 - 14369
- > 14369

Time varying of passenger flow at Bao’an Airport

到达机场人数：5.7万
Passengers arriving at the airport: 57,000

离开机场人数：5.9万
Passengers leaving the airport: 59,000

Departure
Arrival
Passengers arriving at the airport: 57,000

Passengers leaving the airport: 59,000
The above-listed data types are far from all of the big data. They are only our preliminary research and attempt in the master planning. With the further research of planners, big data will be applied more widely to explore more application mode.
3. Future Prospect

Virtual City

Dynamic

Indoor

Overground

Underground

Outdoor
Spatio-temporal Information Cloud Platform

Physical City

Virtual City

Spatio-temporal Information Cloud Platform

Thank you