The Application of GNSS in the Management of the Government Vehicles

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Guangdong BeiDou Navigation Satellite Industry Alliance
• Government Vehicles Management has become more and more important for the government to improve public service ability.
• The former management lacks effective supervision, and in urgent needs of information methods.
Government Vehicle Management Solution based on GNSS

Management System

- Vehicle Terminal
- Administrator of the unit
- Management group of the city public service vehicles
- System maintenance person

The Presentation Layer

- The policy of the usage of public service vehicles

The Application Support Layer

- Uniform identity authentication
- Activity data management
- Protocol analysis
- System management

Base Layer

- Network, hardware platform, database system management

● Vehicle Monitoring
● Real Time Vehicle Tracing
● Emergency Alarm
● Information Release

Vehicle monitoring, commanding and dispatching

- Government vehicle
- Logistics
- School Bus
- Passenger Bus

Wireless Communication Network

Internet

Public Wireless Network (2G/3G)
广州市公务用车使用管理信息系统

欢迎登录系统：监测中心管理员 今天 星期三 2011年8月24日 星期三

实时区域查车 历史区域查车

选择

查询

车辆：

查询条件：

查询结果：

车牌号：

车辆状态：

车辆型号：

查询条件：

查询结果：

车牌号：

车辆状态：

车辆型号：

查询条件：

查询结果：

车牌号：

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查询条件：

查询结果：

车牌号：

车辆状态：

车辆型号：

查询条件：

查询结果：

车牌号：

车辆状态：

车辆型号：
Base on combined BeiDou/GPS navigation
Monitoring the vehicle’s route, parking places, avoiding uneconomic running, clamping down illegal government vehicle usage
The management information system of Guangzhou government vehicles

<table>
<thead>
<tr>
<th>Monitor</th>
<th>Guangzhou government vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>Ten districts, two cities, and a few other regions</td>
</tr>
<tr>
<td>Driving Area</td>
<td>Positioning</td>
</tr>
<tr>
<td>GNSS Application Mode</td>
<td>Velocity Measurement</td>
</tr>
<tr>
<td>Positioning Mode (could be set)</td>
<td>BeiDou+GPS</td>
</tr>
<tr>
<td>BeiDou</td>
<td>GPS</td>
</tr>
</tbody>
</table>
Vehicle Terminal

- BeiDou/GPS compatible receiver
- Identity recognition device
### Key features and specifications

<table>
<thead>
<tr>
<th>Vehicle status and road tracking control</th>
<th>Mileage statistics</th>
<th>Acousto-optic reminder</th>
<th>Remote upgrade</th>
<th>Remote setting</th>
<th>Communication backup</th>
<th>Road tracking compensation</th>
<th>Emergency alarm and abnormal alarm</th>
<th>Low voltage protection and alarm</th>
<th>Low power mode</th>
<th>Emergency shutdown</th>
</tr>
</thead>
</table>

### Accuracy Index

<table>
<thead>
<tr>
<th><strong>Measurement Accuracy</strong></th>
<th>0.1 m/s</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Combined Positioning Accuracy</strong></td>
<td>Level: 10m, Altitude: 10m</td>
</tr>
<tr>
<td><strong>Positioning velocity update rate</strong></td>
<td>1times/s</td>
</tr>
</tbody>
</table>

### Time index

| Cold Start | 37s |
| Warm Start | 1s |
| Loss of lock catch | 1s |

### Signal system and working mode

| Input Signal | B1: 1561.098MHz, C Code; L1: 1575.42MHz, C/A Code |
| Beidou positioning | Support |
| GPS positioning | Support |
| Dual positioning | Support |
The Five Implementation of the management of government vehicles

1. The vehicles tracing and user management
2. Holiday vehicle management
3. The approval of unofficial use
4. The usage publicity
5. Illegal usage management
Identity Recognition

Reminder of forgetting to Plug in the Card

Text Message

7月9日13时05分，您单位车辆粤A发生了未插卡提示，请依规定处理。
【广州市公务用车管理系统】
Real-time vehicle tracking
History query

Electronic fence
cross-border alarm
Vehicle Application Process

1. **A need for vehicles**
   - Application
   - For public use
   - For private use
   - Fill in an application form
   - Scheduling vehicles
   - Approval from apartment leader
   - Approval from unit director
   - Demand End
   - Clear the usage
   - Fill in the mileage of destination
   - Fill in the receipt of using the vehicles
   - dispatch a car
   - signature confirmation from the user
   - Demand End
· vehicles’ status
· abnormal usage
· payment
· mileage
· ……
The Achievement of the Project

- 8440 government vehicles have been fitted with BeiDou/GPS monitoring device
- The system has been running for one year, showed reliable performance and got satisfied feedback
- Not only did vehicle management improve, cases of personal usage markedly decreased
- Reduced the cost, Improved the efficiency

![Average Mileage Saving Chart]

- 2012.02: 28.5%
- 2012.06: 36.5%
Project's Social Impact

- Achieved volume applications of BeiDou in the field of civilian vehicles monitoring
- Got praise from China Satellite Navigation Office, government, and industry experts
- Got media attention, and follow-ups
### GNSS Application Effect

**Static test**

**Location:** Guangzhou Science City, Roof of the 6th floor

**Test Environment:** Broad Vision with no obstructions

<table>
<thead>
<tr>
<th>Test Group</th>
<th>Test date and the weather</th>
<th>Positioning Module/Positioning Mode</th>
<th>HDOP</th>
<th>Number of visible satellite</th>
<th>Positioning accuracy availability (10m, 95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>Aug.4: cloudy 11:04:11～13:19:30 Data set N=10845</td>
<td>T-Module BeiDou</td>
<td>2.181</td>
<td>7.04</td>
<td>90.8%</td>
</tr>
<tr>
<td>Group B</td>
<td>Aug.4: cloudy 10:28:07～13:26:05 Data set N=10715</td>
<td>U-Module BeiDou+GPS</td>
<td>0.784</td>
<td>15.99</td>
<td>100%</td>
</tr>
<tr>
<td>Group D</td>
<td>Aug.7: Clear 13:33:12～16:35:48 Data Set N=10958</td>
<td>H-Module BeiDou</td>
<td>1.39</td>
<td>8.04</td>
<td>100%</td>
</tr>
<tr>
<td>Group E</td>
<td>Aug.8: Clear 16:46:58～18:29:49 Data Set N=6172</td>
<td>U-Module BeiDou</td>
<td>1.43</td>
<td>7.29</td>
<td>97.7%</td>
</tr>
<tr>
<td>Group F</td>
<td>Aug.8: Clear 16:46:43～18:29:58 Data Set N=6182</td>
<td>H-Module BeiDou</td>
<td>1.77</td>
<td>6.6</td>
<td>100%</td>
</tr>
<tr>
<td>Group I</td>
<td>Aug.9: Clear 8:30:16～20:31:34 Data Set N=42662</td>
<td>H-Module BeiDou+GPS</td>
<td>0.74</td>
<td>15.41</td>
<td>100%</td>
</tr>
<tr>
<td>Group J</td>
<td>Aug.9: Clear 8:30:16～20:31:34 Data Set N=40141</td>
<td>T-Module BeiDou</td>
<td>2.42</td>
<td>7.45</td>
<td>94.7%</td>
</tr>
</tbody>
</table>

GNSS Application Effect

Dynamic Test

Aug.29, 2012, Guangzhou Science City, open area

BeiDou Positioning Mode

Dual Positioning Mode

In Guangzhou Area, the application of GPS is fine, BeiDou is usable, BeiDou+GPS has better effect.

Note: Red line means failed to be positioned, belonging to the linear prediction linear.

## User Experience Index Questionnaire of Guangzhou Government Vehicle Project

**User experience index survey**

**Date:** Aug.2012  
**Location:** Guangzhou  
**Target:** 120 vehicles  
Choose one unit from each of the ten districts and two cities, totally 12 units, and 10 cars from each unit  
**Pattern:** Dynamic Test  
**Index:** Positioning Tracing Accuracy  
Positioning Tracing Coherence  
Positioning Results Stability

<table>
<thead>
<tr>
<th>Index</th>
<th>Sum</th>
<th>Average</th>
<th>Degrees of Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioning Tracing Accuracy</td>
<td>973</td>
<td>88.5</td>
<td>Satisfied</td>
</tr>
<tr>
<td>Positioning Tracing Coherence</td>
<td>960</td>
<td>87.3</td>
<td>Satisfied</td>
</tr>
<tr>
<td>Positioning Result Stability</td>
<td>1017</td>
<td>92.5</td>
<td>Very Satisfied</td>
</tr>
<tr>
<td>Total Score</td>
<td>2950</td>
<td>268.2</td>
<td>Satisfied</td>
</tr>
</tbody>
</table>

Guangzhou government vehicle project verified the availability of the BeiDou system.

The multi-system can effectively improve the availability of satellite navigation positioning.

The mature application of BeiDou in Guangzhou government vehicle system played a good demonstration effect in the industry.

Strengthen international technical exchanges, technical cooperation and project cooperation, and jointly promote the GNSS industry booming.
Thank you for your attention!