ITS and Traffic Safety in China

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May 15, 2012
Content

- General Situation of ITS in China
- Improving Road Safety through the Application of ITS
I. General Situation of ITS in China
1. Development Route

1st Stage: Starting
1995-2000
- ITS Strategy
- ITS Architecture

GDP: 790 billion $
Vehicle: 36 m (1995)

2nd Stage: Development & Demo
2001-2005
- Technology research
- Demo in City and Expressway

GDP: 1400 billion $
Vehicle: 90 m (2002)

3rd Stage: Integrated App
2006-2010
- ITS Service in Olympic, World Expo and Asia Games
- ETC in Expressway
- ITS in Water Transport

GDP: 3400 billion $
Vehicle: 160 m (2007)
2. Evaluation of ITS in China

(1) Urban Area
- Major projects: Intelligent traffic management technology R&D and application
- Large City
- Effect: positive

(2) Highway
- Major projects: ETC and Expressway Monitoring
- ETC in 24 province (to the end of Sept. 2012)
  - ETC lane: 5400
  - ETC User: More than 5 million
- Effect
  - ETC: positive
  - Expressway Monitoring: not so well
(3) Traffic Information Service
   - Just beginning

(4) New Technology Research for ITS
   - Just beginning:
     - Intelligent control
     - Data management
     - Interoperability
     - Cooperative system, et. al.

(5) ITS Industry and Market
   - Low level
3. Typical ITS Case Study

(1) Traffic Information Service

◆ Urban areas
  ● Data collection
    ➢ Vehicle detector
    ➢ Probe cars: GPS, Mobile phone
  ● Information service
    ➢ Broadcast
    ➢ VMS
    ➢ Navigator
    ➢ Website
    ➢ Intelligent phone

◆ Expressway
① Probe Car

- **Beijing**: More than 60,000 taxies
- **Shanghai**: More than 20,000 taxies
- **Guangzhou**: More than 20,000 vehicles (taxi+bus)
- **Hangzhou**: About 6,000 vehicles

![Diagram of Probe Car System]

- **Data Base**
- **Communication management system**
- **On Board Unit with GPS and GPRS**
- **Data processing system**
② Traffic Information on Website

- Traffic Info in Baidu
Beijing: Transport Information System
Traffic information service

- Broadcast
- Real Time Route Guidance via VMS
- Navigator
- Website
Traffic Information via VMS

- A integrated system
- Cover urban area
- About 500 VMS
④ Shanghai: City Traffic Info Platform

- Integrated Information Platform
- Information System in EXPO Area
- Information Service System
Traffic Information Collection

Road

City Motorway

Street

Expressway

Information Collection

Loop

Camera

Signal control system

Probe car

Mobile phone
Traffic Information release via VMS
Traffic Information Service via other media

- Info Station
- Micro-blog
- Mobile Phone
- Website
- Call Center
- Navigator
- Broadcast
⑤ Traffic Information via Navigator

- **Navigator no Real Time Traffic Info**
  - Digital Map + GPS
  - Large Numbers: Sold 7 million navigators in 2011

- **Navigator with Real Time Traffic Info**
  - Less than 1 million users total
  - Several companies provide service in different standard
  - RTIC (Road Traffic Information of China)
    - Adopt Chinese Standard
    - Provide Service in Several Cities via FM
    - Website: Map + Road traffic info
(2) ETC in China

① Technology System and Scheme

◆ ETC Standard in China
  ● National ETC Standard : 2007
    ➢ Based DSRC Technology
    ➢ Frequency: 5.8 GHz
    ➢ Semi-Active (awakening) and two pieces OBU

◆ China Expressway ETC System
  ➢ Combined ETC System
Deployment

- Development and Test from 1998
  - Province Demo: Guangdong, 2004

- National Expressway ETC System Pilot Engineering (2007~2009)
  - Must adopt China National Standard
  - Beijing, Shanghai, Jiangsu, Anhui, Jiangxi, Hebei, Tianjin, Zhejiang

- National Wide Deployment from 2010
To the end of April, 2013

- ETC service opened in 26 provinces
- More than 5400 ETC lanes have been built
- More than 5 million ETC users
- Beijing
  - ETC usage rate in main toll station of Jingcheng expressway: 39%
  - Average ETC usage rate in Beijing: 34%
例: 智能城市交通管理在北京市
- Police Command System
- Intelligent Traffic Signal Control System
- Traffic Surveillance System
- Transport Operation and Coordination and Control
① Police Command System

- Command system for Urban Traffic
  - Command
  - Control
  - Information support
  - Emergency management

32 subsystem
② Intelligent Traffic Signal Control System

- Area traffic signal control
- Public transport priority
- City motorway meter-control
③ Traffic Surveillance System
④ Transport Operation and Coordination and Control

- Public Transport
- Freight Transport
- Highway Toll System
- Information Service
- Subway
- ATMS
- Emergency
II. Improving Road Safety through the Application of ITS
1. Cooperative ITS for Traffic Safety

(1) Cooperative System Architecture

Framework of Vehicle-Infrastructure Cooperation
Framework of Vehicle-Vehicle Cooperation
(2) Research Projects

① Communication in ITS

1. Communication Architecture for ITS
   - 1-1 Study of Need for Communication in ITS
   - 1-2 Study of Communication Technology Using Scene in ITS
   - 1-3 Development of Communication Architecture for ITS

2. Communication Technology in ITS
   - 2-1 Evaluation of Key Communication Technology in ITS
   - 2-2 Demo of Communication in ITS
   - 2-3 DSRC Development
Cooperative System Technology Development

- On board system technology
- Road side system technology
- Communication and control
- Simulation
- Integration
③ Connected Vehicle Research

Research in University

Development in Telecommunication Company

SmartEarth 云平台服务

政府车联网云服务
商用车联网云服务
车辆运维与物流电子商务服务

位置信息
导航信息
业务数据
数据储存
数据分析
数据挖掘

移动通信网络
GSM/GPRS/CDMA/3G

互联网
车联网
物联网
④ Standardization

• The Standard Framework of Cooperative System

Application Standard

- Long-Range Service
- Crash Alarm and Prevention
- Identity Authentication
- Smart On Board Unit

Commicication In ITS

Framework and Specification For Cooperation System

DSRC

- Physical and MAC
- Network and App
- Device
Standard Projects in Cooperative System

- Cooperative System, DSRC
  - Part 1: General Technology Requirement
  - Part 2: MAC and Physical Layer
  - Part 3: Network and Application Layer
  - Part 4: Equipment Application

- Cooperative System, Application
  - General Technology Requirement for Telematics Service of Vehicle Monitoring and Traveler Information
  - Function Requirement of Vehicle Crash Warning
3. Demo and Application

(1) Information Service

Demo of Expressway Safety Corridor in Beijing-Tianjin Expressway
TEST: Traffic Information Service via DSRC

OBU: ETC + Information Service
(2) Cooperative System Demo

Cooperative system for Safety
In Beijing-Tianjin Expressway
(3) Vehicle and Fleet Management Systems

- **Driver Management Systems**
- **GPS Monitoring**
- **Tachographs**

Integrated

In-vehicle device and software management systems of regular digital tachographs

Commercial vehicle drivers IC card and fingerprint identity authentication system
National Commercial Vehicle Monitoring System

- Integrated 1000 GPS Service Companies
- GPS Service Company – Province Government Platform – National Platform
  - Sharing information, Monitoring vehicle and driver, Management
- On line vehicle: 1.6 million
(4) Speed limit enforcement and warning systems

Capture camera on a Special road

Speed warning system
## Typical provinces accident index changes before and after the installation of speeding capture

<table>
<thead>
<tr>
<th>Accident index Location</th>
<th>Before installation (year)</th>
<th>After installation (year)</th>
<th>Accident index year (increase +, decrease -)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of accidents</td>
<td>Deaths</td>
<td>Injuries</td>
</tr>
<tr>
<td>Guizhou Province</td>
<td>2005</td>
<td>2006</td>
<td>-79.33%</td>
</tr>
<tr>
<td>Guangdong Provincial Expressway</td>
<td>2004</td>
<td>2005</td>
<td>-70.8%</td>
</tr>
<tr>
<td>Kunming City, Yu Jiang Road, Tai Chi Road, Huijiang Road</td>
<td>2005.5-8</td>
<td>2006.5-8</td>
<td>-54%</td>
</tr>
<tr>
<td>Sichuan Muchuan State Road 213 and Highway 103 lines</td>
<td>2004</td>
<td>2005</td>
<td>-28%</td>
</tr>
</tbody>
</table>
4. International Cooperation

◆ Technical Information Exchanges
  - Examples
  - Data
  - Information of Testing and Evaluation

◆ Joint Research

◆ Seminars and Workshops

◆ Standardization Cooperation
Thank You!