

Status Analysis of Data Collection for ATIS in China



Technology

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ABSTRACT

The traffic data collection should be emphasized, as the establishment of Advanced Traveler Information System (ATIS) is a goal for highway transportation in China and the data collection is a key to ATIS. Compared with some countries or regions such as Europe, Japan and Singapore, there are gaps in traffic data collection in China. These gaps are those the distribution of data collection systems is uneven; some components of the systems are systemless; the number of devices installed is insufficient; the domestic equipment manufacture is weak; the data accuracy is not good and lack of related technology standards. Therefore, some measures should be taken to reduce these gaps, for example, to construct the data collection systems based on ATIS functions; to increase the number of detection devices; to encourage domestic device manufacturers; to enact related standards and manuals; and to enhance the communications and trainings for data collection technicians.

1 Introduction

The transportation in China faces great stress. To alleviate this stress, the government deploys a serious of researches and applications about Intelligent Transportation System (ITS).

Advanced Traveler System (ATIS) is the key subsystem of ITS. The main function for ATIS is to make travelers obtain proper traffic information timely and optimize the traveling behaviors so as to reach the goal of raising the network efficiency and traveling security by collecting, transmitting, possessing and disseminating information.

Data collection is the first link in ATIS. Because the construction of ATIS in China presently is at the early stage, it is practical and important to research data collection system, of which the construction and effect are concerning the coming work.

In this paper, the application status of the data collection for ATIS in some advanced countries and regions are introduced, and the gaps between China and these countries as well as the ways to narrow these gaps are discussed.

2 Concept of data collection for ATIS

In the whole ATIS, the data collection plays a foremost role. The accuracy, timeliness and reliability of the information collection have a great impact on the whole system.

There are many measures in data collection: the most information is mainly collected by kinds of equipment; some static information such as the locations of the signs and service areas along the highways can be checked from the design files directly without extra work; some information the detectors recognizes hardly is collected depending on human surveillance; some public service information can be shared from the other agencies.

3 Status of Data Collection for ATIS

3.1 USA

The United States is one of the countries that deploy ITS first as well as the first country applies modern technologies in traffic data collection. Because of the long developing history of data collection technologies and signals control systems, there are many developed data collection networks in service with large number of devices. For example, there are 48 video cameras and over 2000 inductive loops installed on the freeways in San Jose; more than 200 video detectors and 10000 inductive loops are installed on the freeways around Los Angeles (Chen, 2003). Furthermore, under the leadership of Department of Transportation (DOT), a combination of the local governments, associations, colleges, car manufacturers, and like has been doing researches on data collection technologies, which brings in tests, reports, standards, and applications of new technologies. For instance,

the American Association of State Highway and Transportation Officials (AASHTO) associated with the Institute of Transportation Engineers (ITE) and National Electrical Manufacturers Association (NEMA) to work out the National Transportation Communication for ITS Protocol (NTCIP) 1206 for data collection, in which the objects of data collection and surveillance, the configuration of information and like are defined. Its newest version 01.23 was published in November 2005 (AASHTO, ITE, and NEMA, 2015).

3.2 Europe

Europe is also one of the regions first implement ATIS. Many traffic information systems such as SOCRATES, EURO SCOUT and TrafficMaster are used there. Among these systems, TrafficMaster is of wide service: In the UK, it has 7500 miles of coverage, including all motorways and 95% of all trunk roads using 7500 sensors that provide real-time and forecasted data; in Germany, it has just launched on 9000 km of autobahn or 90% of the autobahn. There are infrared sensors every 2 to 3 km, supplemented by advanced floating car data and additional loop information in certain areas. In France, it works with Renault, France Telecom, and the toll road operator to found a traffic surveillance network using advanced surveillance equipment and government-owned loops. In Italy, it is in a joint venture with Fiat, which focuses on floating car data collection (McDonald, et al., 2006).

3.3 Japan

The Vehicle Information and Communication Systems (VICS) and other vehicle navigation systems are widely applied in Japan for the complicated traffic system. It dates back to 1996 when service of VICS started in Japan ahead of the world. For these past several years, the number of units of VICS receiver shipped by year is about 3 million, exceeding 30 million units in accumulating total in 2011 (Takashi, 2015). To meet the huge demand for traffic information, advanced surveillance networks have been founded in Japan. It is reported, up to the end of 2003, there were 169366 vehicle detectors, 2753 CCTV cameras under the service in Japan (UTMS, 2015). The measures of data collection and the kinds of equipment are varied. For example, on the Hanshin Expressway which extends about 233.8km, there are equipped with 2030 Vehicle detectors, 273 TV cameras, 62 sets of Automated Vehicle Identifiers (AVI), 10 sets of Incident detection cameras, 1125 locations of motorist aid phones, and efficient meteorological system as well as corporation patrol cars which has advanced wireless communication equipment and inspect every route at least once every 2 hours (HEPC, 2015).

3.4 Singapore

The first surveillance system used in Singapore was equipped on 2 tunnels, which were 2.4 km long in total and located as a part

of the urban freeways. In 1996, the government began to apply traffic control system to its urban freeways. The main kind of equipment for data collection is high-coverage-rate video camera (Wang, 1998). To use cameras as traffic incidents detectors instead of traditional inductive loops with image processing technology has found a good application in Singapore. Furthermore, the government of Singapore increases the investment in the traffic data collection to form a full-covered traffic data collection system. A data fusion and sense-making platform has been planned recently by the government to move towards the aim of "Smart Nation" (Sgquan, 2015).

3.5 China

China comes into the field of ATIS information collection later. According to the status of data collection for highway transportation, there is basic traffic surveillance and data collection equipment installed on every freeway; the types of the data collected and the collection measures are continuously enriched; the data collection technologies and equipment manufacture are gained, and the market of surveillance equipment is matured gradually. All of these above drive the data collection for ATIS in China forward greatly (ITSC, 2015).

4 Gaps in China's Traffic Data Collection

Although the traffic data collection for highways has developed greatly in China, there are gaps from these countries and regions ATIS is well severed.

4.1 Limited in the Implementation Fields of Data Collection Systems

At the present time, the traffic data collection and surveillance systems are mainly used on the freeways in China. With regard to the other arterial roads, the data collection systems need to be founded further.

4.2 Systemless in Data Collection

Although the freeways in China have been equipped with basic traffic data collection and surveillance systems, the functions and the types of data collected are irregular for the designs of these systems are not under ATIS, which results in difficulties in the integration of systems.

4.3 Insufficient in the Collection Devices Installed

Because of the insufficiency of road construction funds, there is usually a low installation density of data collection devices in China, which blocks the availability of the accurate traffic data.

4.4 Weak in domestic equipment manufacture

Many kinds of advanced data collection devices used in China rely on imports for the weak foundations of information and electronic industries. The devices imported are also expensive and the use conditions are far different from China.

4.5 Lack of unified technology standards and operation manuals

The technology standards specifically for ATIS data collection have not been published. The devices with different origins, types and functions are sold in the market and the data of the comparison of different devices is insufficient, which causes the difficulty in using the devices and sharing the information.

4.6 Short of communications among the data collection systems' operators

The technicians of the operation companies do not communicate enough, which makes the new problems occurred and the experiences not be discussed and pushed in time.

5 Proposals for reducing the gaps in China

Some proposals are offered to reduce the gaps above.

To increase the investment in the traffic data collection as much as possible and found surveillance systems on the arterial roads besides freeways if conditions permit.

To encourage the device manufacturers to mend their steps in raising the technology, so as to produce the data collection devices suit using in China; enhance the training, specially the adjustment and maintenance of devices, for the system operators, and increase the investment in device late maintenance.

To concentrate on working out the standards about data collection for ATIS; publish the operation manuals based on the summary experience of operators; the tests of device performance and application should be taken to lead the system constructions.

The regular communications should be taken for technicians to discuss problems and share experience.

6 Conclusions

There are gaps in traffic data collection for highway transportation in China compared with some advanced countries and regions, for the early stage China's ATIS construction has been at. This paper has mainly introduced the statuses of data collection for highway transportation in the USA, Europe, Japan, Singapore and China. Otherwise, the gaps between China and these countries are discussed, and some proposals to close these gaps are offered.

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