Travel Time Information in Stockholm based on Automated Vehicle Identification
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Introduction
As real-time information of traffic systems can benefit travelers in managing their trips and making optimum decisions, Advanced Traffic Information and Management Systems (ATIMS) have been the kernel components of modern Intelligent Transportation System (ITS) technologies. Travel time is a key performance measure on road link and network, and can be simply defined as the time necessary to traverse a route between any two points within a road transportation network.

- Travel information provision for road users
- Dynamic traffic management by traffic control centre

Travel time can be obtained from different methods:
- Indirect methods: derived from traffic volume and speed information using mathematical or statistical models based on the physics of traffic flow
- Direct methods: floating vehicle information (taxis, trucks etc.); automated vehicle identification by electronic tags or license number recognition

A general data-mining framework for spatial travel time information

AVI travel time information system in Stockholm

In Stockholm, license plate recognition based AVI system was first deployed for the congestion charging purpose. At the same time, a similar image processing based technology was evaluated for development of a real-time travel time data collection system. The data is planned to be used in the Stockholm Urban Traffic Control (UTC) center, and to provide travelers with real-time travel time information on a number of major routes through the city, both via variable message signs (VMS) and through Internet e.g. (http://www.trafiken.nu).

Recently, license plate matching based AVI system has already started to be deployed as a main system to provide real-time travel time information for motorways, major city arterials at the Stockholm downtown area. The system is planned to spread over the Stockholm downtown area.

Travel time analysis platform: software development

To be able to analyze obtained travel time data, a computing platform, TAO, is developed with distributed MySQL and Oracle databases at the Linux server side and an analytical program written in Python running at the client end. In the server side, collected travel time information is stored in a database that the detailed information of the road network is also presented i.e. the nodes and links/streets by integration with map service.

The system provides a tool for evaluation of different offline and online travel time estimation algorithms and therefore is playing an essential role for real AVI-based travel time system development in Trafik Stockholm.

Contributions and current research

Based on the research and development work, we have provided a first-hand experience on the quality of the data collected by the systems. Now the traffic control centre is able of adjusting the camera positions and directions according to our analysis and suggestions. In addition, we are closely working with the traffic control center in both analysis of the result from production databases as well as building online databases for real traffic information estimation/prediction and publication in Stockholm city.

In addition to the practical data and DB development work, we have been conducting and planning to work on research in different directions:
- Online travel information considering systematic delay
- Online travel time information prediction by data mining of and fusion with historical patterns
- Weather impacts and weekday effects
- Data fusion with other data source e.g. GPS data from taxis

Acknowledgements and references

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