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Integrated data imputation and annotation tool: Trace Annotator

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Abstract. This paper presents a tool for integrated imputation and annotation of GPS tracking data, Trace Annotator. The tool is designed to efficiently and effectively transform raw GPS data into segmented activity and travel data where transportation modes, travel purpose at destinations, time and route information related to the spatial and temporal profiles were automatically generated. Bayesian belief network and other main machine learning approaches have been incorporated. The tool has been empirically applied and validated in several national and international pilots.

Keywords. GPS, Imputation, Transportation

1. Introduction

Tracking data collected through GPS brings a lot of opportunities to both research and applications in further understanding the spatial and temporal distribution of human movement and activities. Over the year, research trend has shifted from the conventional floating car data to fine grained and multimodal individual-based tracking, e.g. GPS loggers, smartphone tracking, which brings wide research interests in different disciplines, such as transportation, health, location-based services, etc.

In transportation, significant efforts have been put forward in recent. One of the triggers in such activities is the potential advantages of using GPS to replace traditional travel surveys according to the high accuracy, low cost and the possibility of collecting panel data. The central issue is of course how to extract the activity-travel diary data which basically represents transportation mode, travel purpose, travel time, activity duration, activity location, route, etc. Trace Annotator is such a tool which can comprehensively impute these information from GPS data and deserve a relatively high
accuracy. This paper will briefly present the functionality, technical details and the performance of Trace Annotator.

2. Trace Annotator

Trace Annotator is functioned to extract from GPS data activity-travel diaries. It works smoothly based on the advanced machine learning approach and impute the information based on multisource datasets, e.g. road network data, publication transportation data (line and stops), spatial land use data and point of interest data. Most of the data are open data which can be easily obtained. Figure 1 presents the details of the tool.

![System architecture and functionality of Trace Annotator.](image)

3. Conclusion

Trace Annotator has been applied and examined extensively in national and international projects. Results conclude with a highly acceptable accuracy and stable performance. Trace Annotator has also been applied as a servlet for processing large scale real-time data online. Continuous development and extension are ongoing.

References


