Chapter 4
Collecting Activity–Travel and Planning Process Data Using GPS–Based Prompted Recall Surveys: Recent Experience and Future Directions

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ABSTRACT

This chapter details the design, implementation, and evaluation of an Internet-based prompted recall survey that utilized GPS data collection. The design of the survey was unique in terms of prompted recall surveys using GPS with the use of instantaneous data processing, learning algorithms to reduce respondent burden, and the inclusion of questions relating to activity-planning behavior in a prompted recall survey. In the Urban Travel Route and Activity Choice Survey (UTRACS), data was collected on long-term activity-travel behavior and planning processes for 112 individuals over an average of 10 days. The results of the survey show that the planning data obtained from the survey respondents appear to be reliable, with minimal fatigue and conditioning effects. The documentation of the survey design process, coupled with the promising results, show how GPS-based prompted recall surveys using an Internet-based survey mode can collect useful activity processing data over long timeframes.

INTRODUCTION

It has been generally observed that collecting travel survey data for households has become increasingly difficult in recent years due to falling response rates, difficulty reaching respondents by telephone and a number of other issues. Meanwhile, there has been an increasing use of new activity-based models for regional planning purposes that tend to require data on the full activity-travel pattern.
of individuals, and in some cases may require details regarding the underlying activity planning and scheduling process. The need for such data has the tendency to increase the complexity of the survey instrument and therefore the burden on the respondents. As the data needs for modeling have grown, research into more sophisticated methods of data collection has been conducted and a number of advances have been made. In recent years, this has motivated the use of GPS data collection that has numerous advantages over more traditional survey types. The use of GPS data collection has been found to improve the accuracy of spatio-temporal data over what can be reported by respondents directly (Wolf et al., 2001). The use of GPS data tracking has also proven valuable in correcting trip underreporting in traditional travel surveys (Wolf et al., 2004). Finally, recent efforts have shown that substantial portions of the household travel survey can be entirely automated, such as identifying modes and trip purposes, which can further reduce respondent burden. This reduction in burden can allow for more in-depth questions to be utilized in a GPS-based prompted recall and would potentially allow for longer survey durations, as respondents may not tire of the survey as quickly.

This chapter describes a recent survey that utilizes GPS data collection and an Internet-based instrument, which is used to investigate activity-travel planning attributes. The survey process and instrument design incorporate techniques identified from past research, and includes several new contributions to improve data processing, improve recall times and reduce respondent burden. The impetus for the survey design improvements is the desire to better understand the underlying activity planning process, which necessitates the addition of various process-related questions to the standard activity-diary survey, regarding such issues as the timing of activity planning decisions, the flexibilities regarding those decisions, etc. The addition of these questions to the standard activity diary could quickly overwhelm the ability of respondents to effectively complete the survey. Therefore, the survey has been designed in such a way as to minimize the amount of time spent answering non-behavioral process questions. This has been operationalized through the use of a Web-based survey instrument that allows respondents to upload GPS trace data at their leisure and automatically generates an interactive prompted recall survey in which many of the standard activity-travel attributes have been automatically determined. This chapter focuses primarily on the design issues and challenges faced during the development of the survey, paying special attention to the issues of equipment selection considerations, data processing improvements, techniques to reduce respondent burden and respondent experiences with the survey. The results of the survey are briefly discussed, and interested readers can find full details in Frignani et al., (2010).

The remainder of this chapter is structured as follows. First, a review of previous and ongoing work in GPS travel surveying is given. The data reduction routines, including data cleaning and location finding algorithms are then presented. The overall design of the survey is then shown and the development of the burden reduction routines is described. The implementation of the survey for the Chicago region is next described. Finally, a discussion of the user experience during the survey process is presented.

**BACKGROUND**

The use of GPS data in activity and travel surveying is a relatively new practice, made possible through improvements in the technology itself and the demand for more accurate travel data. The use of GPS data began with a series of demonstration studies designed to prove the ability to use GPS for identifying activity-travel patterns, and has branched out to several more advanced applications in travel surveying. Currently, most