Chapter 3
Ubiquitous Travel Environments and Travel Control Strategies: Prospects and Challenges

Caspar Chorus
Delft University of Technology, The Netherlands

Harry Timmermans
Eindhoven University of Technology, The Netherlands

ABSTRACT

In the near future, ubiquitous travel environments in which travelers have direct access to information and communication technology will become widely available. In principle, it will allow various organizations and companies not only to provide real-time dynamic information but also to induce travelers to behave in ways that contribute with some underlying personal or system-wide objective (e.g. avoid risk, environmental concerns etc). The latter application assumes a sufficiently valid and reliable model of traveler response to information provision or recommendation. As these two fields have mainly developed in isolation, the purpose of this chapter is to provide an overview of the state of the art of these two fields.

INTRODUCTION

In recent years, transportation research has witnessed a tremendous growth of interest into the use of modern Information and Communication Technology (ICT) for data collection. Because of rapidly declining response rates of traditional travel surveys, modern mobile technology is viewed as an important alternative for these traditional surveys in collecting data about individual travel patterns. Mobiles devices range from laptop computers, Personal Digital Assistants (PDAs) and mobile phones to mobile game computers. In the near future, new technologies such as Augmented Reality may become widely available. Also changes in wireless networking will offer new opportunities: cellular telephony is moving from low-bandwidth to higher bandwidth (UMTS-Universal Mobile Telecommunications System) to support more advanced services (e.g. graphics). Wireless networks provide a higher bandwidth but are primarily used for laptops and PDA's. Hotspots support access to the internet. Bluetooth provides a low-bandwidth, short range protocol for communication between devices (e.g.

DOI: 10.4018/978-1-61520-769-5.ch003

mobile phone and head set). An upcoming technology is WIMAX (Worldwide Interoperability for Microwave Access) that provides a long range, fast connection and potentially competes with the UMTS standard.

Another line of transportation research that has gained substantially in academic interest concerns the provision of travel information in an attempt to trigger particular travel behaviors that would contribute to sustainable mobility. Originally, travel information was descriptive and distributed to a group of travelers. The tendency however is to move from static, descriptive information to dynamic, prescriptive information. Applications include tourist guides (e.g., Abowd et al., 1997; Arikawa, Tsuruoka, Hideyuki & Ome, 2007; Baus, Chevherst & Kray, 2005), leisure and health (e.g., Mc. Creadie et al., 2006) and travel assistants (e.g., Chorus & Timmermans, In Press; Hurtig, 2006; Rehl, Bruntsch & Mentz, 2007; Winter & Nittal, 2006). These developments lead to ubiquitous travel environments: the idea that information can be shared in a network environment from some geo-sensors providing users with information readily available anywhere, for any person and at anytime. This information can be descriptive, but can also relate to recommendations.

These two research frontiers in transportation research have largely emerged as separate lines of development, and researchers have predominantly made a contribution to either one or the other line of development. In this chapter, however, we argue that these separate literatures can potentially be combined in interesting and innovative ways. One of the key factors influencing the potential of using ICT to influence individual behavior in a particular way is to detect with the least possible error the current and future behavior of individual travelers. This requires accurate information in time and space about current and perhaps past behavior of individual travelers. When used in isolation, tracking technology such as GPS is insufficient in this regard as it only provides information about route choice behavior and the current position of the person tracked. However, in principles such data can be enhanced with other spatial and non-spatial data. Moreover, GPS (Global Positioning System) traces can be interpreted using particular algorithms to derive information about other facets of activity-travel patterns. This information can then be used to provide personalized travel recommendations. The problem here is that little is known about how travelers use such information, whether they act strategically and how they adjust their behavior. If however models of response behavior can be developed successfully, information can also be provided taking into account strategic behavior to better meet the objectives of the underlying control strategies.

In this chapter, using the prospect of merging these lines of development as a framework, we will discuss recent progress in both fields of research. In terms of data acquisition, we will discuss the development of the use of Geographic Information Systems (GIS), radio frequency identification (RFID) and other technologies to collect data on space-time behavior of individuals. This is followed by a discussion of models that have been suggested to predict traveler response to information and advice. In that context, it is relevant to distinguish between neutral personal information and control strategies that provide advice to individual travelers in an attempt to persuade them to adopt particular behaviors such as to optimize some underlying system-wide objective.

DATA COLLECTION STRATEGIES

Collecting data on people's space-time behavior has a long history in disciplines such as transportation, geography, tourism and urban planning. Such data have been predominantly been collected using travel surveys. Respondents were typically asked for one or more days to report the activities and travel they conducted during that time, plus some trip characteristics such as duration, motive,