

Chapter 1

Data Collection on Personal Movement Using Mobile ICTs: Old Wine in New Bottles?

Martin Lee-Gosselin
Université Laval, Canada

Sean T. Doherty
Wilfrid Laurier University, Canada

Amer Shalaby
University of Toronto, Canada

ABSTRACT

This chapter examines the current status of data collection methods employing location/time-aware devices to observe evolving patterns of spatio-temporal behaviour, including patterns that are affected by ICTs. Drawing mostly on transport research, it is suggested that two streams of development have emerged: a “passive” stream that maximises the automatic interpretation of positioning data, and an “active” stream, that is using increasingly sophisticated mobile computing devices and/or the Internet to engage respondents in the validation, interpretation and enhancement of their own data. Recent and future developments are described that promise to go beyond simply using technologies to carry out conventional travel surveys: rather, some new classes of data may be obtained, notably because of common or overlapping interests with other fields, such as public health research. There are, however, some ethical and public acceptability constraints that must be respected.

INTRODUCTION

Amidst growing evidence that Information and Communication Technologies (ICTs) may be having profound effects on the organisation of human activities in space and time (Dijst, 2004), survey researchers have focussed on the challenges of col-

lecting data that is sufficiently detailed, and with sufficiently long observation periods, for the study of such effects. Conventional methods, notably time-use and activity-travel diaries, can provide valuable micro-behavioural data, especially if a trained interviewer questions a respondent in-depth around a “skeleton” of self-observations, such as a simplified travel log. But this is rarely done for

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more than one or two days, and is considered too burdensome for periods of more than seven days, even though diaries have occasionally been used with success to collect minimal spatio-temporal data over multi-week periods, such as six weeks. Of course, increasing respondent burden aggravates many standard problems of surveys, especially recruitment and selection bias, item non-response, and invalid response. It is therefore no surprise that survey methodologists are increasingly exploring the use of ICTs as part of their *toolkit* to reduce respondent burden while collecting person-based data on spatio-temporal behaviour. The length of observation and the level of detail sought is compatible with a holistic, multi-scaled, and interpersonal view of the spatial extent of human activities, and with detecting phenomena such as the temporal and spatial fragmentation of activities, coordination with others and (ideally) multitasking.

In this paper, we examine two major streams of ICT-enabled activity and travel data collection methods that have emerged. The first is essentially *passive* and envisages the largely automatic interpretation of spatio-temporal monitoring data. The second *active* stream is highly interactive. It uses portable and web-based computing technologies to allow subjects to validate automatic interpretations, typically every 1-2 days; it also allows for more immediate interaction with subjects, such as live queries directly following a passively tracked specific event (e.g. a fall by a pedestrian). We give an overview of the status of these two streams, and then look forward. We draw primarily on the experience of a multi-university team in Canada that, since 1995, has experimented with mostly off-the-shelf ICTs to devise new ways of measuring personal activity and travel patterns in urban areas. We start with a brief summary of the earliest methods. This is followed by a discussion of an overall architecture for ICT-enabled activity and travel data collection methods, and then a section each is devoted to the “passive” and “active” streams. A sixth section speculates about a

number of new measurement concepts that seem ripe for development. In a final section, we ask ourselves how far we have come in using some ICTs to help study phenomena that are influenced by all ICTs, discuss the probable limits of the usefulness of these methods, and examine some of the risks that may be entailed for society and for researchers.

THE INITIATION OF ICT-AIDED DATA COLLECTION METHODS

While the use of ICTs to understand vehicular traffic is a relatively mature art, the same cannot be said of related methods to understand human activity in time and space. For more than 20 years, increasingly miniaturised electronic sensor and computing technologies have made it possible to collect timed microbehavioural data on human subjects and to record the data in portable loggers. For example, in the public health and sports medicine literatures, one finds citations of research into free activity using portable accelerometers going back to 1984 or earlier (Matthew, 2005), and as we discuss below, the measurement of physical activity is a rapidly expanding field of research that is taking advantage of the potential of multiple sensors.

In the travel behaviour field, since the mid 1990s, attention has inevitably focussed on the potential of location-aware systems such as Global Positioning Systems (GPS), triangulation on FM radio stations, or the automatic reporting of the location of mobile telephones in the “cells” employed by GSM (Global System for Mobile communications). We have seen a diversity of efforts to take advantage of such systems to collect temporal and spatial data on human mobility with unprecedented levels of detail and accuracy and, moreover, to collect data in an automatic or semi-automatic manner over much longer periods of observation than are covered by the vast majority of travel and activity diary methods.

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