

Chapter 10

Show Me My Way: The Use of Human Spatio–Temporal Behaviour Patterns for Developing Ubiquitous Wayfinding Systems

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ABSTRACT

The growing amount of ubiquitously available location based information offers great chances for the development of mobile pedestrian navigation services. Yet, providing spot-on real-time adequate information remains challenging, as relevant information needs to be filtered and group-related behaviour patterns and preferences are still insufficiently known. In this chapter, the authors focus on two aspects. Firstly, they consider the issue of how to comprehensively investigate human spatio-temporal behaviour patterns in order to enable the provision of customised navigation information, and secondly, they discuss potential impacts of ubiquitous wayfinding systems on human perception of space and possible resulting navigation behaviour modifications.

INTRODUCTION

Recent years have seen tremendous progress in the field of developing services, devices and networks for ubiquitous information provision. The idea to utilise rich and interactive content, with devices that are always at hand and over networks that can be accessed anywhere, is becoming increasingly popular. Although this ideal cannot yet be achieved entirely due to several limitations (e.g.

limited network mobility or content capabilities), the ability to utilise “any information, anytime, anywhere” comes into reach. It can be expected that e.g. growing amounts of publicly accessible computers that interact with pervasive mobile devices such as mobile phones will enable ubiquitous information access at least in urban environments in the not too far distant future. This is especially interesting regarding the development of mobile wayfinding tools for pedestrians, which will be able to use location based information for richer and more efficient navigation support.

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However, the increasing amount of ubiquitously available environmental and navigational information aggravates effective information extraction for the user and necessitates the customisation of wayfinding instructions and additional environmental information to individual needs. The provision of information tailored to individual preferences and current context situations requires profound knowledge about pedestrian wayfinding behaviour and related determinants. This can be achieved by a comprehensive analysis of movement patterns and underlying preferences and individual attitudes. Recent developments have produced a vast amount of emerging technologies focusing on the collection and analysis of human movement data. One field of particular interest is the use of space by pedestrians, the related influence factors determining movement patterns, and the impact of information and navigation services to the perception of space and wayfinding behaviour. In this respect, our research focuses on the identification of behavioural types of pedestrian mobility styles, which include quantitative-statistical movement data as well as qualitative-interpretative data concerning lifestyle-related influence factors. The identification of core determinants and the classification and description of homogeneous classes of pedestrian motion patterns and type-related interest profiles provide the basis for developing personalised wayfinding services which can offer location-related information tailored to group-related interests and walking preferences.

In particular, two research questions are followed in this contribution. Firstly, we consider the question of how can a comprehensive investigation of human walking patterns and related influence factors (motives, preferences, habits) be used in order to develop customised navigation and information systems. Secondly, we discuss the issue of which impacts on human perception of space and spatio-temporal behaviour can be expected from the use of ubiquitous wayfinding support.

The chapter starts with an overview of previous research in the field of human spatio-temporal behaviour, focusing on influence factors identified in related studies, as well as applicable empirical methods in pedestrian route choice behaviour research. The second part introduces a currently ongoing research project focusing on the development of a model of pedestrian mobility styles describing spatial behaviour patterns and corresponding determinants. The project follows a synergetic approach comprising several complementary quantitative and qualitative empirical methods in order to comprehensively investigate human walking behaviour and related determinants. We present initial results from experiments conducted during the first of two consecutive phases of data collection and analysis in two shopping environments in Vienna, and discuss the suitability of the preliminary outcomes for application in emerging adaptive mobile navigation services for pedestrians. The chapter concludes with a critical discussion of potential impacts of ubiquitous navigation and information systems on human spatio-temporal behaviour.

RELEVANT INFLUENCE FACTORS ON HUMAN SPATIO- TEMPORAL BEHAVIOUR

Studies on environmental preference and route choice behaviour confirm that pedestrians prefer certain routes owing to their environmental qualities, such as relative quietness and greenery (Blivice, 1974). Being the most vulnerable traffic participants, pedestrians are very sensitive to any unfavourable conditions. Hence, in many cases route decisions are not just driven by simply minimising the distance that has to be covered. Usually, the choice of a specific route depends on multiple factors, like the task a user wants to perform, the actual environment and individual preferences associated with personal attitudes and

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