

Pervasive Navigation



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Keywords

Ubiquitous computing,
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search and navigation,
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discovery and ranking.

Overview

In this project we investigate navigational assistance tools in the situation brought about by ubiquitous computing. In ubicomp, material and digital objects coexist in a single environment which possesses both spatial and information characteristics -- a fact that presents new challenges to users or visitors in finding their way to particular objects or information that they are seeking.

By blurring the boundaries between the physical and the digital, ubiquitous computing constructs mixed spaces that are the source as well as the repository of massive amounts of information created by their use, a fact that severely limits the capability of humans to navigate effectively this situation. Trails can play a critical role for the development of effective navigation tools in this case and they are at the core of the techniques discussed in this poster.

Approach

At the core of our techniques are *trails* that is, sequences of interactions between users and locations, material or digital artifacts and other users. Trails can be observed and recorded by most ubiquitous computing environments albeit at different degrees of detail. The most common type of trail would be one that results from the use of a location sensing technology whereby users are timed and traced while traversing a particular area. At the other end of complexity, rich records of interaction can be recorded using a variety of sensing capabilities and would include exchanges of information with digital artifacts and other users, setting or following hyperlinks between physical objects, detailed descriptions of such interactions for example proximity and orientation towards an object, or creating and browsing annotations of specific places.



Significant trails over the city of Bath (Bluetooth scanning data courtesy of Vassilis Kostakos and the Cityware project).

Goals

We aim to develop new methods and techniques that assist navigation effectively while provide high-performance and can thus support processing of large-scale environments. In particular, we propose a stochastic model for the representation of trails and trail aggregates, and suitable data structures for efficient storage, filtering and retrieval which result in significantly improved performance. We also propose algorithms and associated metrics that we use to rank trails and identify significant ones.

In the long-term, we aim to develop a general purpose engine for search and navigation in ubiquitous computing environments.

Reference

D. Papadogkonas, G. Roussos and M. Levene, 2006, Discovery and Ranking of Significant Trails, *2nd International Workshop on Exploiting Context Histories in Smart Environments* (ECHISE 2006) at UBICOMP 2006, Irvine, CA,