

## Analysis, Prediction and Classification of Pervasive Computing Trails



### Project Leader(s)

Dikaios Papadogkonas  
dikaios@dcs.bbk.ac.uk  
George Roussos  
Mark Levene

### Project Web Site

<http://www.dcs.bbk.ac.uk/~gr/projects/ubigoogle.html>

### Keywords

Ubiquitous computing, location-sensing, search and navigation, wayfinding, trails, discovery and ranking

### Project Aims

Many pervasive computing applications involve the recording of user interaction with physical and digital resources in the environment. Such records can be used to establish context histories that can be subsequently utilized for user behavior analysis, pattern recognition, prediction, and the provision of context aware services. Even though several approaches to tackling this problem exist, there is no unified approach that allows system usage analysis, pattern recognition and prediction for a plethora of different applications under one probabilistic model.

In this project, we address the need for such a unified approach which allows the analysis of different pervasive system datasets.

### Overview

We define a trail as the sequence of recorded interactions with the pervasive computing space. Trails contain patterns of space usage and they can be used for the provision of different services, space usage analysis or sociological information of people using the environment simultaneously. Trail analysis requires considerable storage and computational resources to discover such patterns. To store trails we introduce a probabilistic directed graph where we store user trails incrementally.

### Ranking Engine, Prediction and Classification

The ranking engine uses different metrics associated with the tree nodes to provide a series of trails as output that



Significant trails over the city of Bath (Bluetooth scanning data from the cityware project)

corresponds to different user specified characteristics. Moreover, we use different metrics to evaluate the predictive power of our model and we introduce a new classification algorithm that can identify users from the trail they followed.

### Reference

D. Papadogkonas, G. Roussos and M. Levene, 2008, Analysis, Ranking and Prediction in Pervasive Computing Trails, IET Intelligent Environments (IE08), Seattle, 21-22 July.  
Dikaios Papadogkonas, Michael Zoumboulakis, Jenson Taylor, Mark Levene and George Roussos, Real-Time Auditing of Domestic Robotic Cleaners, International Journal of Smart Homes, Vol. 2, No. 1, pp. 81-94. January, 2008