

Ubiquitous Computing in Mobile Environments

We conduct research on analysis of context data and personalization of mobile applications. We undertake both basic research, e.g. analysis of acceleration data, and application-oriented research.

Some Results

The PUPS project has an own information flyer. Other results:

Gathering context information: BeTelGeuse [1] is a platform for gathering and processing context information. It has been designed to be extendable to new sensors and to run on different mobile devices. See Fig. 1. The software is available under an open source license.

Interpreting context information: [2]: Existing context-aware mobile applications often rely on location information. Raw location data such as GPS coordinates or GSM cell identifiers are usually meaningless to the user. We have proposed a statistical method for identifying locations meaningful to the user from raw data consisting of GSM cell transitions that are enriched with GPS information, whenever a GPS device is available. See Fig. 2.

Context-dependent user modelling: In order to adapt to the environment of the users, devices need to be able to deduce the user's goals and information needs, which in a mobile environment potentially depend on the user's situation. We have built a context-dependent user modelling system that supports Bayesian networks and rule-based reasoning and we have conducted empirical analysis of personalisation techniques for contextual data [3].

Adaptive user interfaces: Capricorn [4] is an interface for mobile widgets applying various adaptive web techniques for facilitating navigation. It uses collaborative filtering to recommend suitable widgets and it dims infrequently used ones. Also context data from the mobile device is used to adapt the service contents. See Fig. 3.

References

- [1] P. Nurmi, J. Kukkonen, E. Lagerspetz, J. Suomela and P. Floréen: "BeTelGeuse – a tool for Bluetooth data gathering." Proc. 2nd Intl. Conf. on Body Area Networks (BodyNets, Florence, 2007)
- [2] P. Nurmi and S. Bhattacharya: "Identifying meaningful places – the nonparametric way." Proc. 6th Intl. Conf. on Pervasive Computing (Pervasive, Sydney, 2008), LNCS 5013, Springer-Verlag, 111-127
- [3] P. Nurmi et al.: "A system for context-dependent user modeling." Proc. OTM Federated Workshops (Montpellier, 2006). LNCS 4278, Springer-Verlag, 1894-1903
- [4] F. Boström, P. Nurmi, P. Floréen, T. Liu, T.-K. Oikarinen, A. Vetek and P. Boda: "Capricorn – An intelligent user interface for mobile widgets." Proc. 10th Intl. Conf. on Human Computer Interaction with Mobile Devices and Services (MobileHCI'08, Amsterdam, 2008), 327-330



Fig. 1. Using BeTelGeuse to gather data from several sensors.



Fig. 2. Meaningful locations identified.



Fig. 3. Capricorn widget display.

Contacts: Patrik Floréen and Petteri Nurmi
email: firstname.lastname@hiit.fi, homepage: www.hiit.fi/adaptive-computing