Location based Informationsystems

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In this paper we describe a series of projects on location based and personalised information systems. We start with a basic research project and we show how we came with the help of two other more application-oriented projects to a product. This is developed by a consortium of enterprises and it already is in use in the city of Koblenz.

1 The Idea

In the mid 90s, a colleague had a brand new Palm III, we were waiting on a train station in a small Dutch city and began dreaming: what if we could use this Palm to get information about this location, about interesting places around the station and so on and so forth. Back at home we wrote a project proposal and we received funding for the MIA Project [4]. This was the beginning of a series of projects on this topic we want to describe in this paper. Recently, Raj Reddy and Jaime Carbonell, declared a new "Bill of Rights" of the Information Society [11], therein they claimed, that we should

- get the right information,
- to the right people,
- at the right time,
- in the right language,
- with the right level of detail and
- in the right medium.

We feel that the project described in the following, contribute at least to some of these claims

2 The Projects

The first project in this series, the MIA project mentioned above, assumed that the palmtop device was equipped with a GPS system for its localization and had access to the internet. In addition the system had access to a user profile on a server and hence was able to answer personalized and location-based queries. In the successor projects, described in this section, we avoid connecting to the internet via the mobile device; instead we are focusing on free of charge access to Bluetooth access points. We describe IASON, a basic research project and SpatialMetro, a an EU project in the area of tourist guidance and finally we shortly describe CityGuide-Blue, a product which is an outcome of these projects, which is currently used by the city of Koblenz.

2.1 The IASON-Project

The IASON[1] project, funded by the "Stiftung Rheinland-Pfalz für Innovation", aims at providing mobile users (users of a PDA or a mobile phone) with location-aware personalized information. Motivated by the development of powerful mobile devices and the semantic web, we defined a *Semantic Mobile Environment*. In such an environment, so-called service nodes are installed at chosen points of interest. These service nodes broadcast messages to nearby mobile users

using bluetooth wireless technology. The kind of message depends on the location of the broadcasting access point. For example a bookshop could send its latest offers, a pub could present its menu and the schedule of events to its customers or a bus station could offer information about the delay of the next scheduled busses.

One of the main aspects of the project to mention is that the information will be delivered to the user free of charge. On top of that, the information sent is specific to the access points location. The most interesting feature from a scientific viewpoint is the filtering technology. The huge amount of information which will be sent is filtered by the mobile device according to the profile set by the user. For that we annotated the messages semantically with a Description Logic (DL) [2, 3] concept. We also gave the users the opportunity to build their individual interest profile, which was constructed as a DL concept, too.

The user profiles and the semantically annotated messages are based upon the same terminology. So we built a small ontology for our semantic environment. The profile and the ontology are stored on the mobile device. Both are part of the mobile agent, shown in figure 1, which was implemented in J2ME[2]. This application [9] was the first usable prototype of the project. It is able to do more than just storing and displaying incoming messages. It includes a powerful reasoning engine which is able to solve TPTP problems. This reasoner, called Pocket KRHyper [8], is a re-implemention of the KRHyper [14] system. It is the first theorem prover for first order predicate calculus running on a mobile phone. More information about the entire approach can be found in [6].

To get an idea of what happens inside the mobile application we created a simplified test scenario where we tested our IASON concept. We set up the test-run to gather more data and get hands-on experience with these technologies. This test-run was conducted at the cafeteria of the University of Koblenz. The daily cafeteria menus were broadcast at all times. A client was available free of charge via Bluetooth data transfer for the cafeteria visitors, bundled with profiles fitting the menu and major food tastes. Along with the data and application transmission, users had the opportunity to fill out feedback forms and discuss the technology online in the University newsgroup.

Let's shortly describe how it works. The terminology, profile and annotations are considered to be a finite set of axioms $C \sqsubseteq D$ and $C \equiv D$, where C, D are concepts of the Description Logic $\mathcal{ALC}$ extended by inverse roles and role

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[1] http://www.uni-koblenz.de/~iason

[2] http://java.sun.com/javame/index.jsp