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German Abstract

EMBASSI ist ein vom Bundesministerium für Bildung und Forschung (BMB+F) gefördertes Projekt, welches die Entwicklung multimediale Bedienassistenten für elektronischer Geräte zum Ziel hat (siehe topics 1/2000). Dabei steht die benutzerzentrierte, individualisierte und situationsgerechte Mensch-Technik Interaktion in privaten Anwendungsbereichen im Vordergrund. Die Vision des Leitprojektes ist die Vereinfachung der Bedienung technischer Geräte unter Nutzung neuer Formen von anthropomorphen und multimodalen Systemschnittstellen, welche einen integrierten und allgegenwärtigen Zugriff auf vernetzte Geräte und Dienste ermöglichen. In Bezug auf die Vernetzung verschiedener Geräte (Fernsehgerät, PC, Audio-Anlage, Lichtsteuerung) sowie in Bezug auf die situationsgerechte Assistenzfunktionalität nimmt die Technologie der Intelligenten Agenten eine Schlüsselrolle ein. Eine zentrale Komponente hierbei ist die Kontextverwaltung. Sie speichert beispielsweise Informationen über die physische Situation und den Benutzer und ist damit Grundvoraussetzung für eine situationsgerechte Assistenzfunktionalität. Darüber hinaus integriert die Kontextverwaltung einen »white page« und »yellow page« Dienst sowie einen Routingmechanismus, welche die effiziente Kommunikation der Systemkomponenten auf Basis einer Agentenkommunikationssprache ermöglichen. In diesem Artikel wird die Kontextverwaltung zur Realisierung der »context-awareness« der EMBASSI Applikation skizziert.

Introduction

In the project EMBASSI sponsored by the German Ministry of Science and Education (BMB+F), the ZGDV Department of Mobile Information Visualization focuses its work on the integration of intelligent agent technology. The goal of the EMBASSI project is to provide service assistance for consumer electronics in private households, individual traffic and in the terminal domain (automatic teller machine).

The personal agent as human computer interaction (HCI) paradigm helps the user to efficiently accomplish the task to »control« electronic systems, like, e.g., recording movies on VCR, watching TV, listening to music in cars. The focus of the EMBASSI system is the most natural and user-oriented assistance. If, for example, the user wants to record a TV movie on the VCR he points to the movie and says »record the movie, James«. Therefore, speech-recognition and multimodal inter-

faces play an important role in the project. The user interface of the service assistant might have a three-dimensional avatar, which is one focus point of the developments of the ZGDV department Digital Storytelling.

In order to provide sufficient service assistance, knowledge on the environment and user context is a prerequisite. This context consists of semantically enriched sensor data to describe the current physical situations, the resource states, the user preferences and several other profiles. Information about the user (e.g., tracking the user location or attention) and his preferences enables the provision of pro-active service offerings.

The most challenging approach from a software engineering point of view is that a number of independent and heterogeneous system components of an environment are to be connected via an intelligent bus system. To speed up and simplify the integration

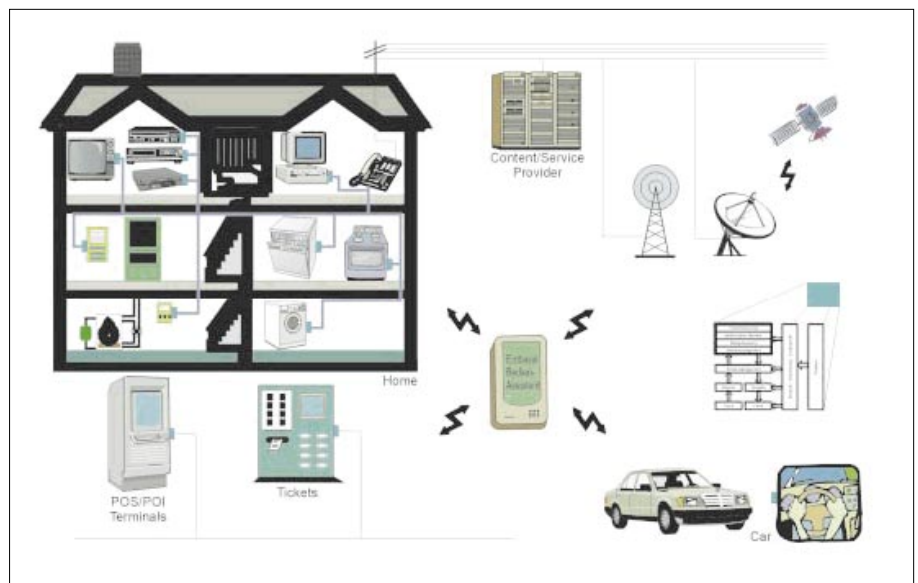


Figure 1: Service assistance for consumer electronics

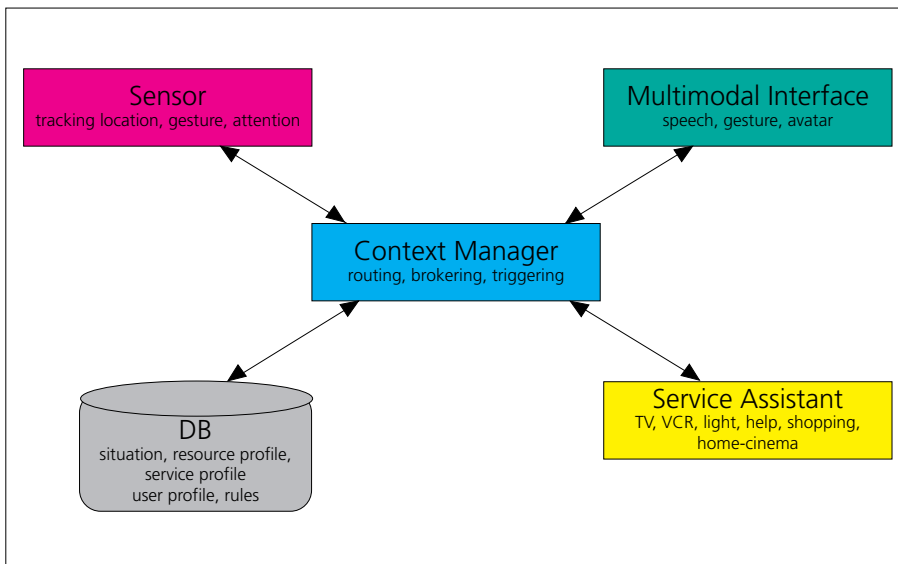


Figure 2: The context manager serves as a facilitator within the multiagent architecture

process, an agent communication language (ACL) is proposed and will therefore be supported in the project work.

Context Management

From our experience in mobile computing research we learnt that the provision of context-aware applications has a great impact on offering real intelligent assistance, not only in the mobile area. Such context-awareness of software applications is established by information about the location of the user, the environment in which the user moves, the detection of a user's presence or absence and several additional information about physical objects in his surroundings. Context-aware enriched applications can react to the users changing context automatically and instantly in the best way. The detection of a user's presence in his home environment might lead to an evaluation process to determine a next relevant action such as the notification of important telephone calls.

With regard to this context-awareness, one of the central components of the EMBASSI system is the context manager. In comparison to a traditional database system, the context

manager does not only serve as a simple passive system providing persistent storage, session management, etc, but as a global knowledge base and facilitator service. Thus, the context manager enables central persistent storage of data, the registration (white page) and brokering (yellow page) of system components and services and is responsible for the initial start-up of the whole system. In order to provide sophisticated communication between the system components, the context manager offer an event propagation or triggering mode based on situation-action rules in addition to its pull mode. The triggering mode enables for instance a pro-active service offering capability and the advantage of processing the situation information at their source avoiding communication overhead between the system components. Moreover, all communication with the context manager is performed by using an ACL. As ACL we chose the de facto standard KQML which has already proven its potential for several years and which seems to be most suitable for our needs.

We gained some experience with our AdaWeb system for the adaptation of Web content to the

actual mobile device context. Furthermore, we won a thorough insight to location tracking using position receivers like GPS within our system Loci. We also carried out some experiments with the ActiveBadge system and in the field of agent technology. These experiences improved our research and development of the context-manager.

Conclusion

Intelligent assistance and mobile multimedia context-awareness is becoming a prerequisite for efficient successful applications. With our developments and the integration of agent technology we improved applications by adding context-awareness. This is a step beyond location-aware systems. Location-awareness only accounts for the location of the user. This helps to filter and adapt the content based on this information. Including additional sensors and context information, e.g. device profiles and user preferences, allows for an additional information processing to really assist the user. Our work on intelligent agents and basic agent infrastructure components, such as the context manager, will be the basis for further developments in our department.

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