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EMBASSI (Multimodal Assistance for Infotainment and Service Infrastructures) [1] was one of the focus projects dealing with human-computer interaction that investigates technologies for the creation of systems to assist the user in the interaction with his personal environment. The main focus of EMBASSI relied on assistance systems belonging to infotainment within the home and cars and on service infrastructures like terminals, with a special respect to handicapped people.

This article gives an overview about the multiple research and development activities of the INI-GraphicsNet institutes and their departments involved within the EMBASSI project and it should outline their scientific excellence within the field of multimodal infrastructures and assistance technologies.

EMBASSI faced the challenge that computers become more and more ubiquitous, moving from the desktop into the infrastructure of our every day lives and thus influencing the way we interact with our personal environment. An ensemble of devices and applications fuses into a system many users are overstrained in using all of the functionalities that become possible. Thus the interaction with natural speech or gestures becomes more and more important as well as the system's ability to recognize user goals and the ability to develop strategies to transfer those user goals into strategies able to change the personal environment matching the wishes and the preferences of the user. Figure 1 should outline this vision: As the user points to the television set and says »louder please«,

German Abstract

EMBASSI (Elektronische Multimediale Bedien- und Service Assistenz) war eines der sechs Leitprojekte der Mensch-Technik-Interaktion des Bundesministeriums für Bildung und Forschung (BMBF). 20 Partner aus der Industrie und Forschung waren an diesem Verbundprojekt beteiligt. In drei Anwendungsszenarios (Privathaushalt, Kraftfahrzeug und Terminalsysteme) wurden auf Basis der generischen EMBASSI Architektur Komponenten zur multimodalen Interaktion und zur Unterstützung von Benutzern mittels Assistenztechnologien entwickelt. Viele der in EMBASSI entwickelten Arbeiten fließen in neue Projekte ein. Ein kompletter Demonstrator kann unter www.embassi.de als Open-EMBASSI heruntergeladen werden.



Figure 1: A home infotainment scenario that points out the multimodal interaction possibilities of the user with his personal home environment



Figure 2: The PoS / PoS terminal as an automatic teller machine and the personal assistant showing shopping possibilities

the EMBASSI system combines and interprets the single user utterances consisting of the commando and the gesture so that the television set will adjust the loudness.

Consequently, EMBASSI developed an architecture for assistance applications following the topology of pipelines. The generic multimodal EMBASSI architecture differentiates between unimodal input and output devices for the communication with the user and for the recognition of single user utterances. The following passes are done by multimodal fusion components and the interpretation of joined user utterances into user goals.

These user goals are analyzed by assistants using different strategies of artificial intelligence to accomplish the user's wishes by manipulating the personal environment.

Different departments of the INI-GraphicsNet were involved in the development and realization of the multimodal architecture, as well as in specific demonstrators based on this underlying architecture as well as in concrete applications executing important functionalities at different locations of the architecture. The following will sum up the main results and activities.

Distributed Agent Systems

The three different EMBASSI scenarios home infotainment, automobile electronics, and public PoS / PoI terminals, are based on the generic EMBASSI architecture, which was realized with an Agent Management System using the agent-communication language KQML. The data-flow driven EMBASSI architecture is also represented with a new communication model for data-flow based distributed agent systems (Soda-Pop) that is implemented during the project time for evaluation purposes and builds the fundament for upcoming projects (the DynAMITE project, for example [2]) and new research and development activities.

Public PoS / PoI Terminal Assistance

To assist users (in particular handicapped people) using terminals, innovative interaction possibilities with terminals and personal multimedia assistants were developed and demonstrated prototypally (cf. figure 2). The personal multimedia assistants are separate devices locating terminals and their services in the nearer environment. Interaction is possible with speech, by touch screen, joystick, or even braille. The following demonstration scenarios were realized: the usage of a cash terminal and the usage of a vending machine with individualized purchase lists. While interacting with the terminals and the personal assistants, the user is assisted by adaptive interfaces using macros for individualized interactions. To secure the communication of the different agent management systems, running on the terminals as well as the personal assistants, the EMBASSI agent platform is able to detect and to connect different independent agent platforms and to make interoperability possible of agents belonging to different platforms. Through this development it has become possible that a vendor agent running on the personal assistant communicates with the appropriate agent on the vending machine to assist the user in the best possible way, for instance.



Figure 3: The driving simulator of the car environment

Assistance Technologies

Some researchers of the INI-GraphicsNet developed technologies assisting the user with input and output components as well as with components processing user and environment data to manipulate the devices according to the user's goals and wishes:

- A driving simulator, based upon the Avalon technology, to support the user in having a real car assistance experience (cf. figure 3)
- Components for gesture recognition to record user movements and to make real multimodal interaction possible within the user's environment
- A shopping assistant to support the user buying movies while using the home infotainment installation
- A virtual character that guarantees human computer interaction and represents system output to the user (cf. figure 4)

- A model for a generic user profile for multimodal environments and a personal adaptive assistant for the selection of movies
- Context management that supports the whole agent management systems and its components with environment and personal user data
- And a planning component, which is able to develop execution strategies according to the user goals using the given possibilities of the devices connected

Summary and Outlook

The results of the EMBASSI project demonstrate the widespread excellence of INI-GraphicsNet's research and development activities. Considering the evolution of human computer interaction to assistance technologies and distributed autonomous environments, the INI-GraphicsNet resides on a strong

position. This is shown in further projects, for example in GEIST [3] and in DynAMITE as well as in the IZA and art-E-fact projects [4].

A demonstrator can be downloaded and trailed as OpenEMBASSI from the EMBASSI webpage to experience the assistance and interaction technologies of EMBASSI (cf. figure 5).

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References

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- [2] <http://www.igd.fhg.de/~dynamite>
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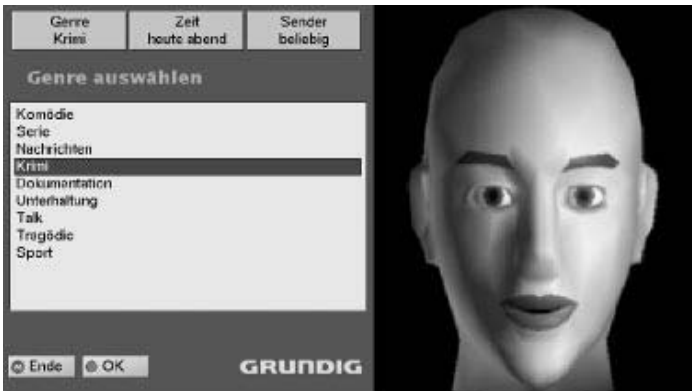


Figure 4:
The virtual character in co-operation with the electronic program guide assist the user while selecting a movie



Figure 5:
OpenEMBASSI