

DynAMITE – The Approach to Ubiquitous Computing within dynamic ad-hoc Device Ensembles

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Intelligent multimodal interaction with distributed networked devices within dynamical, changeable ensembles requires software technology concepts that make coherent acting of single devices possible. The Fraunhofer Institute for Computer Graphics, together with Loewe and the European Media Laboratory, faces within the project DynAMITE the challenge to develop and implement such a software framework. DynAMITE will make it possible that devices and software components of different software producers can interact spontaneously to analyze the users' interaction to interpret their goals and to realize those goals by using the interoperability abilities of the whole device ensemble. This approach expands the interaction possibilities in a more comfortable way than today's plug and play mechanisms.

of the existing other computers or beamers, for instance. Because of the personal preferences of the user, the possible presentation of documents will happen with the help of a beamer and the light will darken. But the same should happen in every possible meeting or lecture room. The presentation should be seen bright and clear and the lights should go down. This can only be achieved, if all devices form a spontaneous ensemble, which is able to cooperate according to the user's preferences. The devices must be able to interoperate dynamically; they must be able to work out a shared strategy and to act homogeneously according to the conjoint goal. One of the applications will be the Universal Remote Control, which is explained in an article also presented in this topics edition.

German Abstract

Das DynAMITE-Framework wird es ermöglichen, dass Geräte und Softwarekomponenten unterschiedlichster Hersteller spontan miteinander kooperieren können, um gemeinsam die Interaktion des Nutzers zu analysieren, seine Intentionen zu bestimmen und Strategien für die Realisierung des Nutzerwunsches durch den Geräteverbund umzusetzen. Erste Ergebnisse des Projekts werden im Frühjahr 2004 in Gestalt eines Demonstrators verfügbar sein, der die Vision der Dynamisierung von ad-hoc Ensembles zeigen wird. Dieser Demonstrator wird auf der Projekt Web Seite verfügbar sein. Zeitgleich wird ein Forum installiert, welches den Informationsaustausch mit interessierten Anwendern ermöglicht. Der erste öffentliche DynAMITE Workshop wird im April 2004 stattfinden. Das Verbundprojekt wird zusammen mit den Partnern Loewe und EML realisiert.

The Vision

Imagine a personal digital Assistant (PDA) as your personal assistant to organize your preferences and your working files, which are distributed among your home or business network (cf. figure 1). Coming into a meeting, the PDA detects all available other DynAMITE devices and it builds a spontaneous ensemble with them. The interaction and presentation possibilities are increased by the abilities



Figure 1: Different personal digital assistants acting as personal managers of preferences and making interaction with the environment ensembles possible.

Approach

In the world of ad-hoc ensembles, an application or a network of fixed components does not exist any more. The single devices form instead a dynamic ensemble that allocates functionalities, which will be combined ad-hoc to fulfill certain goals. This also means that there cannot be a central place of intelligence or agent management, but that means that the devices and software components must be able to interact and to interoperate together autonomously and spontaneously. Within the EMBASSI project, a topology of components was developed in order to interpret user utterances, to establish strategies and to execute those strategies with the help of the given functionalities of the connected devices. The approach of SODA-POP extends this topology with semantic levels the components arrange autonomously according to their internal ontologies. DynAMITE will use these concepts to develop strategies that provide mechanism of self-organization,

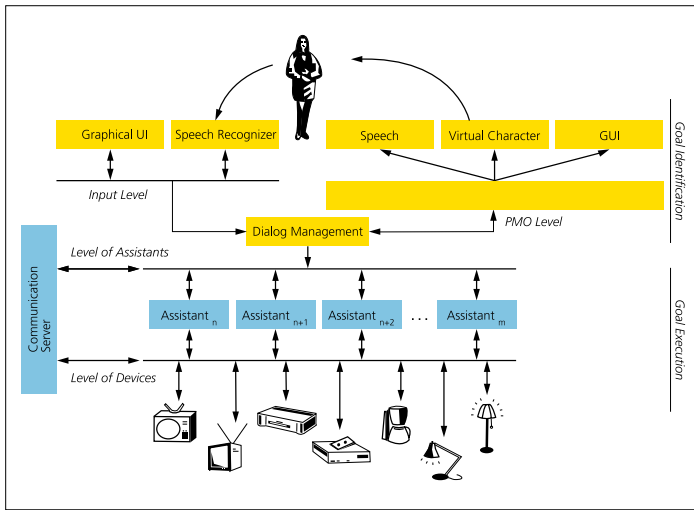


Figure 3:
The topology of the first DynAMITE demonstrator. It can be downloaded and evaluated from the project web page in spring time 2004

problem decomposition, and decision strategies to prevent concurrency situations of comparable components and to maintain the interoperability of those spontaneous device ensembles. Picture 2 points out the different approaches of today's realizations to interact with the devices available. The left side of the illustration demonstrates the common interaction mechanisms with infrastructure devices. The user interacts with each single device, here the user establishes and accomplishes the possible strategies himself. In the middle of the illustration, the user interacts with a central assistant component. It interprets the user's interactions and controls the devices connected by its own intelligence. But what will happen if a new device with new functionalities is connected? The rule base (or other artificial intelligence mechanisms) of the assistant has to be extended. Thus dynamic ad-hoc ensembles are impossible. The right illustration of the picture shows the vision of DynAMITE. The devices form an ad-hoc ensemble. The user interacts with this ensemble like he interacts with a single

device, and the ensemble will develop execution strategies spontaneously and it will carry them out.

The First Demonstrator

Several research developments of the partners of DynAMITE will be brought together to establish a first demonstrator that should outline the vision of dynamic heterogeneous ad-hoc ensembles. The SODA-POP infrastructure and demonstrator consisting of a communication server, which makes the architecture topology and some ontology levels with decision strategies available, together with some assistants and components for multimodal interaction, such as dialog management, speech recognition, and virtual characters together with a level for poly modal output strategies, will outline the vision of heterogeneous ensembles. Full plug and play functionalities will be available (cf. figure 3). All intelligence in this demonstrator is, of course, located within one communication server. The research activities will aim to realize distributed component manage-

ment and thus they will realize full self-organization of all possible DynAMITE devices. The demonstrator will be available during the next quarter of the year and can be downloaded from the project web page for demonstration and evaluation purposes.

Results Expected

To subsume the research activities within the project: DynAMITE will develop a software framework that will:

- Ensure the independence of each device resp. software component
- Allow the dynamic extension of device ensembles with new components
- Avoid central components and thus support self-organization of ad-hoc ensembles
- Identify the basic topologies of heterogeneous ensembles, the functional roles, and the ontologies necessary

The DynAMITE Forum

Research and demonstration activities and a DynAMITE forum will be established simultaneously. The forum should ensure the dissemination of the project vision and results among interested companies and institutions. The goal is to get feedback and also requirements of as many interested parties as possible and thus to ensure the use of the DynAMITE framework among the mobile community. The first public workshop, demonstrating the vision and the first project results, will be held in April, 2004.

Acknowledgement

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The Dynamite Project Web Site:
<http://www.dynamite-project.org>

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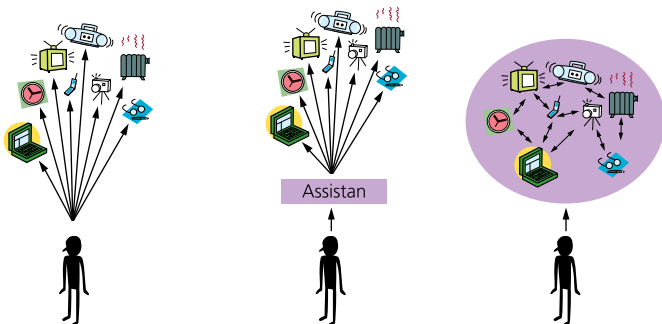


Figure 2:
The three common ways of interacting with device ensembles