# 14

# Challenges in Mobile Information Systems and Services -Extended Abstract -

*R. Strack*
*Computer Graphics Center (ZGDV)*
*Wilhelminenstraße 7, D-64283 Darmstadt, Germany*
*Phone: +49 6151 155-231, Fax: +49 6151 155-480*
*Email: strack@zgdv.de, URL: http://www.zgdv.de*

## 1 INTRODUCTION

Mobile Computing introduced mobility as a new dimension to computer applications. Users of mobile devices are freed from location constraints and do not longer need to stick to their cumbersome desktop systems. Mobile devices such as laptops, notebooks, or PDAs – providing the necessary communication facilities and basic services already by themselves or connected to a data capable (cellular) phone – can be used to access remote services and resources. In order to realize the vision of "All information at your fingertip" for both experts and end users, applications must be provided that are capable of interactively accessing, manipulating, and visualizing distributed multimedia information. Users expect to handle all types of multimedia data (including time-dependent data) with mobile devices as with desktop systems at least within the limits of those systems.

However, due to the low bandwidth of wireless narrowband wide-area networks (such as the 9.6 Kbit/s of GSM, DCS-1800) and the limited resources of mobile devices, the handling of distributed multimedia applications and services faces severe problems. Thus, effective solutions have to be provided as an underlying basic technology for mobile information systems and services. We call this research field mobile information visualization.

Besides the fundamental problems raised in regard to response times and transfer rates required for mobile multimedia applications and services, mobile information visualization addresses numerous practical usability issues. This includes:

- visualization and navigation tools for complex/huge information spaces (e.g., the WWW);
- downloading mechanisms for visualization purposes;
- adaptable and configurable user interfaces; usage of real-world metaphors; and
- support of new input devices (pen, touch screen) and interaction techniques (handwriting, speech recognition.

Below, selected research projects and prototypes of ZGDV are outlined that contribute to that field.

J. L. Encarnação et al. (eds.), *Mobile Communications*

## 2 MOBILE MULTIMEDIA DATA HANDLING

The objective is to develop a mobile multimedia middleware (MoWare) that provides a layered architecture for developers of mobile multimedia applications with a set of APIs, tools, and services at different levels of abstractions. MoWare, that is currently being established, addresses the provision of enhanced services for multimedia data handling and interfaces for the integration of communication mechanisms and/or services into applications.

One basic concept being established for the MoWare is the internal representation of a multimedia task defined by the user as a pipeline. Each component of the pipeline – a pipeline is either pre-composed or being established dynamically – represents an atomic process. A framework is being established that enables the dynamic utilization of available resources via resource dependent delegation of the processes. This framework encompasses a resource information base as well as a resource and a task manager.

## 3 SUPPORTED SEARCH BY CONTEXT VISUALIZATION

The objective of SuSe (Supported Search Service) was the establishment of a tool that supports the location and discovery of information within complex information structures on stationary and mobile devices. The prototype* of an interactive resource discovery system visualizes the current context to improve the exploration of the organization and the content of a resource space.

The SuSe server is a meta-information system containing indexes of summaries and a classification repository. The summaries are reasonably small sized descriptor objects, which contain meta-information to describe a document and to point anyone to the original data. The classification repository describes the relationship between these characteristics. This enables a structured view onto the available documents.

The user interface of SuSe combines the advantages of browsing and searching. It uses the information categories of the server to guide the user, who is searching for information in its resource space. A request is visualized via a search tree. At each level of the search tree the user can refine his request by defining a further descriptive search or by selecting the sub-context, that best matches his information needs. Several user interface metaphors and the 3D-perspective are used for the support of intuitive interaction even for the first-time, naive users.

## 4 HYPERFUNK – A PERSONAL MOBILE INFORMATION SYSTEM

HyperFunk (Hypermedia in Mobilfunk) was a project for the development of innovative information services with wireless data transmission†. The HyperFunk prototype represents a

* The SuSe prototype was developed within a DeTeBerkom project, tailored for a typical "real-world" application scenario of a town council.

† It was carried out by ZGDV in cooperation with DeTeMobil GmbH.

dynamic extensible mobile information system that provides access to both public and private data. The modules and concepts of HyperFunk can be used as a basis for a wide variety of mobile applications due to their configurability and extensibility. Examples can be found in all fields where access to remote documents is necessary, for example in medicine, maintenance, and sales.

On the architectural level HyperFunk consists of two main components: Mobile data clients (Windows95-based) of the user and the stationary data server (UNIX based). The server offers various information services that can be accessed by the mobile user through the data services of the GSM-based D1 network.

In regard to information visualization and interaction HyperFunk offers a dynamic object system based on HCL, a LISP-like dialect. Specialized object behavior can be migrated transparently from the server to the client. The object system enables the introduction of new information types as well as their interaction and presentation methods: The system provides an easy modeling of the information by information providers. The device of the mobile user recognizes new classes of information and loads automatically respective method definitions from the information provider.

The user interface of HyperFunk represents the information space through real world metaphors: The user is able to interact with the system based on familiar analogies to concepts they already know. The main user interface metaphor, a service center, visualizes a building that provides services and personal information in different rooms of the building. HyperFunk offers a wide variety of interaction methods which help users to navigate and find information in an intuitive way.