Mobile Location-Based Services for Darmstadt

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The »MobileGIS-LS« project demonstrates a mobile city information service enhanced with the multimedia representation of specific points of interest. The service is realised on the basis of an integrated platform which combines the different applications for the functionality that is provided. The main component within the overall architecture is a web-based GIS that supplies mapping and routing functionality. The implemented »DA-Mobil« platform primarily offers the following functionalities:

- a mobile map representation of Darmstadt
- a textual and visual routing service within Darmstadt
- video sequences depending on the location
- the 3D visualisation of significant areas or buildings

The idea behind »MobileGIS-LS« is to provide a web-based map information service enhanced with location-based services (LBS) in order to illustrate sites of interest in a more attractive and recognisable manner. The LBS currently provide video sequences and VRML visualisations of specific locations. An important aspect of the prototype system is the seamless integration of the accessible media. This enables the user to gain a realistic impression of the location he is interested in before he gets there.

The implementation of »DA-Mobil« is based on a freely accessible map service that provides detailed maps of Darmstadt with zooming capabilities, measurement information and a mandatory registration service. The full functionality of the location-based services, including multimedia features, is available to the user after registration. The core features of the system are:

- the presentation of address-based positions on the city map,
- textual and visual map-based routing between two places,
- a location search by destination name (e.g., Restaurant »Darmstadt«), and
- a search for individual points of interest within a specified area.

German Abstract

Im Bereich zukünftiger Anwendungen in mobilen Umgebungen wird ortsabhängigen Diensten eine große Bedeutung zugestanden, gestützt vor allem durch die rasante Entwicklung in der Leistungsfähigkeit der mobilen Endgeräte (Mobiltelefon, PDA, Smartphones) und dem Ausbau der UMTS Netze. Hier ergeben sich komplett neue Möglichkeiten für die Bereitstellung und Aufbereitung von individuellen, ortsbezogenen Informationen. Gerade im Bereich von graphischen Informationsdiensten bietet sich die Möglichkeit multimediale Präsentationstechniken, wie die Benutzung von Videosequenzen und 3D Darstellungen zu nutzen. Im Folgenden wird das stiftungsgeförderte Projekt »MobileGIS-LS« vorgestellt, welches solch einen Dienst für die Stadt Darmstadt als »DA-Mobil« bereitstellt.

Figure 1: Screenshot of the »DA-Mobil« Internet presence

Figure 2: Example of the web-based routing service on a PDA showing the routing functionality including videosequences of different locations.

The user can connect to these services via the Internet using a web browser on a typical PC or a PDA. »DA-Mobil« was developed and tested on a Compaq iPAQ Pocket PC within a WLAN network. The primary focus of the project is the mobile use of the system to investigate future possibilities for mobile applications within a UMTS network.

To support different application environments, different user interfaces must be implemented in order to satisfy the handling requirements for PCs and PDAs. This must also be taken into account for the implementation of the video and VRML services. For the streaming video, different videos/streaming rates (in terms of screen dimensions and file size) must be provided depending on the user terminal. The 3D visualisations in the form of VRML objects are subject to similar limitations concerning the complexity of the 3D geometry and the hardware capacity of the mobile terminal.

Streaming video content proved to be very stable within the system implementation of the project. Quality on the Compaq iPAQ platform was particularly satisfactory. During the project, it was discovered that an acceptable appearance could be obtained with a frame rate of 15 fps. With respect to the different platforms and network connections, the video content was processed with display dimensions of 176x224 and 320x200 pixels and a streaming bandwidth of 56kBit/s, 80kBit/s and 150kBit/s. VRML scene presentation was preprocessed on a back-end server. Scene adaptation was performed depending on the type of end-user device. This resulted in a reduction of scene graph complexity where necessary.

In order to achieve a general service solution that could handle various user devices, it was necessary to concentrate functionality at the server as much as possible. This is known as a thin-client-fat-server solution. Therefore, an architecture based on dynamic web pages was chosen. Active Server Pages (ASP) are used to control communication between the various services and the web presentation. The navigation and mapping functionality was implemented with the Intergraph products GeoMedia Web Enterprise (as a Web Map Server) and intelliWhere (as a Location Server).

The »Darmstadt Mobil« project is a joint project of the Fraunhofer IGD - A5, ZGDV - Z3 and GIStec GmbH.

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