Location-Based Multimedia Services for Tourists

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INTRODUCTION

The evolution of mobile technologies and their convergence with the Internet enable the development of interactive services targeting users with heterogeneous devices and network infrastructures (Wang et al., 2004). Specifically, as far as cultural heritage and tourism are concerned, several systems offering location-based multimedia services through mobile computing and multimodal interaction have already appeared in the European research community (LOVEUS, n.d.; Karigiannis, Vlahakis, & Daehne, n.d.).

Although such services introduce new business opportunities for both the mobile market and the tourism sector, they are not still widely deployed, as several research issues have not been resolved yet, and also available technologies and tools are not mature enough to meet end user requirements. Furthermore, user heterogeneity stemming both from different device and network technologies is another open issue, as different versions of the multimedia content are often required.

This article presents the AVATON system. AVATON aims at providing citizens with ubiquitous user-friendly services, offering personalized, location-aware (GSM Association, 2003), tourism-oriented multimedia information related to the area of the Aegean Volcanic Arc. Towards this end, a uniform architecture is adopted in order to dynamically release the geographic and multimedia content to the end users through enhanced application and network interfaces, targeting different device technologies (mobile phones, PDAs, PCs, and TV sets). Advanced positioning techniques are applied for those mobile user terminals that support them.

SERVICES

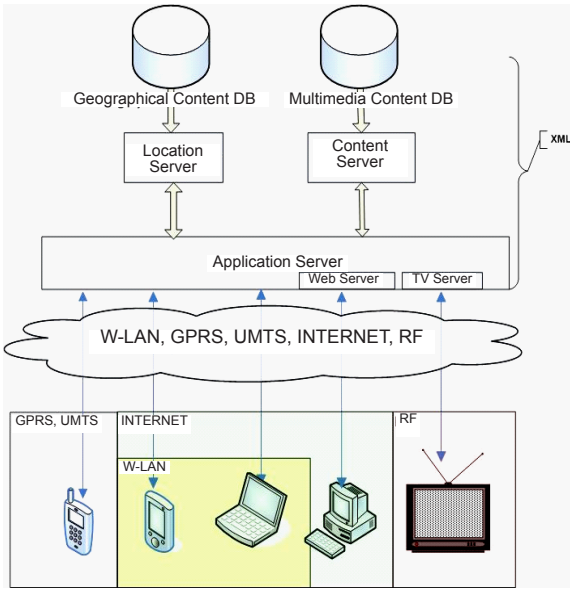
AVATON is an ambient information system that offers an interactive tour to the user (visitor) in the area of the Aegean Volcanic Arch (see http://www.aegean.gr/petrified_forest/). The system can serve both as a remote and as an onsite assistant for the visitor, by providing multimedia-rich content through various devices and channels:

- over the Internet, via Web browsers with the use of new technologies such as rich-clients and multi-tier architecture in order to dynamically provide the content;
- with portable devices (palmtops, PDAs) and 2.5G or 3G mobile phones, which are capable of processing and presenting real-time information relevant to the user's physical position or areas of interest; and
- via television channels—AVATON allows users to directly correlate geographic with informative space and conceivably pass from one space to the other, in the context of Worldboard (Spohrer, 1999).

With the use of portable devices equipped with positioning capabilities, the system provides:

- dynamic search for geographical content, information related to users' location, or objects of interest that are in their proximity;
- tours in areas of interest with the aid of interactive maps and 3-D representations of the embossed geography;
- search for hypermedia information relative to various geographic objects of the map;
- user registration and management of personal notes during the tour that can be recalled and reused during later times; and

Figure 1. The AVATON architecture



- interrelation of personal information with natural areas or objects for personal use or even as a collective memory relative to visited areas or objects.

THE AVATON ARCHITECTURE

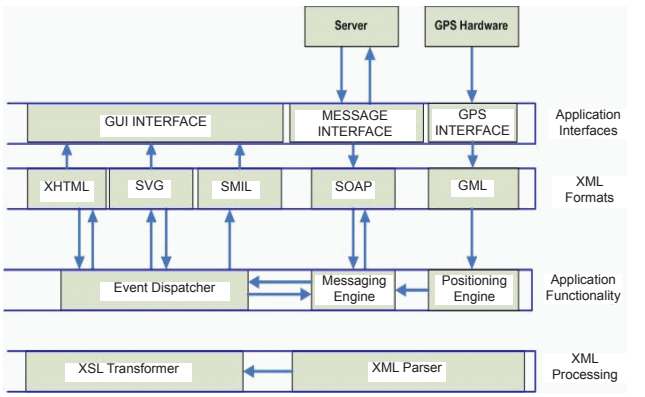
Overview

The AVATON system is based on a client-server architecture composed of three main server components: the application server, the content server, and the location server. The application server combines information and content from the content and location servers, and replies to client requests through different network technologies. The content is retrieved from two kinds of databases, the geographical and multimedia content DBs. The above architecture is shown in Figure 1.

In more detail:

- **Multimedia Content Database:** This database contains the multimedia content such as images, video, audio, and animation.
- **Geographical Content Database:** A repository of geographical content such as aerial photos, high-resolution maps, and relevant metadata.
- **Content Server:** The content server supplies the application server with multimedia content. It retrieves needed data from the multimedia content database according to user criteria and device capabilities, and responds to the application server.

Figure 2. The XML-based technologies in the client side



- **Location Server:** Serves requests for geographical content from the application server by querying the geographical content database. The content retrieved is transformed into the appropriate format according to user device display capabilities and network bandwidth available.
- **Application Server:** The application server receives requests from different devices through GPRS, UMTS (third-generation mobile phone), W-LAN, Internet (PDA, laptop, PC), and RF (television). The server identifies each device and transmits data in an appropriate format. More precisely, the application server incorporates a Web server and a TV server in order to communicate with PCs and televisions respectively.

Client

This section focuses on the mobile-phone and PDA applications. The scope of the AVATON system includes Java-enabled phones with color displays and PDAs with WLAN or GPRS/UMTS connectivity. While all the available data for the application can be downloaded and streamed over the network, data caching is exploited for better performance and more modest network usage.

When the users complete their registration in the system, they have in their disposal an interactive map that initially portrays the entire region as well as areas or individual points of interest. For acquiring user position, the system is using GPS. The client also supports multi-lingual implementation, as far as operational content is concerned, for example menus, messages, and help. These files are maintained as XML documents. XML is extensively used in order to ease the load of parsing different data syntaxes. A single process, the XML Parser is used for decoding all kinds of data and an XSL Transformer for transcoding them in new formats. The different XML formats are XHTML, SVG, SMIL, SOAP, and GML, as shown in Figure 2.