Standardised Geospatial Information Services on Mobile Devices

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INTRODUCTION

Due to the rapid development of the Internet as a medium of information and the constant rising of bandwidth, also in the private households, information systems based on maps have meanwhile become widespread applications in our societies. A special problem is that the commercial business still develops its own, often proprietary solutions, for the visualization of geodata. Users have not the possibilities to select individual information which is information that is relevant for them in a specific situation. One step to overcome this problem is to rely only on such systems that consider well-known standards of interoperability. To guarantee highly interoperable systems, the Open Geospatial Consortium (OGC) has worked out specifications for the interfaces for web based GIS, for instance. These specifications have to be used for the exchange of map-based information between various distributed computers, as well as mobile devices.

This paper focuses on some results that come from a research project focusing on the sustainable improvement of the public transportation in the National Park Harz, an ecologically outstanding nature reservate in the middle of Germany.

MOBILE DEVICES

A classification of the currently available mobile devices has been carried out without complaining completeness. On the one side stands the category of the proprietary mobile phone systems. This sector is mainly representative through closed operating systems with just a few interfaces for third party applications. On the other side the growing market of smart phones must be mentioned. This includes mobile phones with operating systems that are extendable with software from other providers. These devices are very powerful today. The operating systems are mainly Symbian OS or Windows Mobile. A small part of the devices contains a Linux-System. The category of the smart phones is going up into the category of the personal digital assistant (PDA). These devices are comparable with the high end smart phones but they are not able to communicate over a conventional net for cell phones like the Global System for Mobile Communications (GSM). It supports mostly a wireless LAN (WLAN) interface for the communication.

The development of software on Symbian systems are mostly carried out in Java. On Windows Mobile system runs a premature support of the Java Virtual Machine and the operating system is focused on the .NET Compact Framework. A lot of the PDA-devices in Germany are pre-installed with the Windows Mobile operating system. Therefore it was decided to develop a first prototype of the mobile application using Windows Mobile in the .NET Compact Framework. Another reason is that these devices rather contain a GPS receiver than a smart phone.

PROTOTYPE

At the beginning of the project mentioned before it was one aim to request and use geodata through standardised interfaces (WMS). The opportunities had to be analysed and tested through a prototypical application. An important aspect was an uncomplicated handling through selected automatism. Questions of data sizes and storage limitations and their consequences for the performance of mobile devices were investigated using the prototype. A presupposition was during the whole development process, to build the application based upon the standards of the Open Geospatial Consortium. This enables the separation of the application and the provider of the maps.

The application has to configure itself on a free selectable Web Map Service. There is just few information that the user has to enter, apart from committing the URL and the path of the map-file to the map service. With this information the application is able to make a request to the specified web map server. The first request is the GetCapabilities request that is standardized in the WMS-Standard by the OGC. The application gets a XML-document from the server. This document is stored in the program folder on the mobile device and would be parsed by the application. It is possible to request and view the map in the main menu of the application. In this menu the user has some functions to navigate in the map.

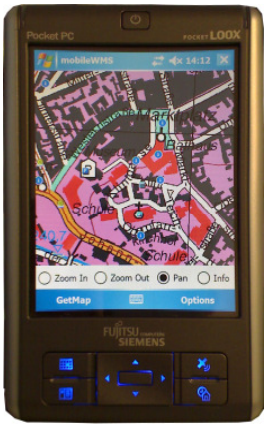

Figure 1: Mobile-WMS-Client realized in .NET Compact Framework.

3D-Support

Works on 3D-Implementation for smart phones resulted in a prototypical Application, realized in Java, for Symbian smart phones. This Application can visualize 3D scene graphs from a Web3D-Service. The concepts of the 3D-Clients developed for smart phones were very important for the PDA-client. First considerations resulted in an idea to extend the WMS-Client with a 3D-view. This would be an option to define a section on the 2D-view, send the values of the boundary box to the server which creates a scene of the selected area. But for a usable implementation some special points had to be considered, for example the question how large the selected area could be. Large areas use a lot of computing power to create the scene. The bandwidth of the data channel is also very restricted.

Figure 2: Mobile-3D-Client for Geodata realized in Java by Jan Grohmann.

PROBLEMS

The relatively small network coverage of WLAN-Hotspots is still a problem especially in Germany. Additionally, they are often due to fees. That is a reason why users have to calculate with a lot of costs due to the pricing policy of the provider. In centres of industry there exist WLAN-Hotspots which are usable after a completion of a contract with the provider. This type of connection has an acceptable bandwidth and is currently preferred.

For using the application "off-road" it has also to work in poor populated regions, especially when those mobile applications should be used in areas such as national parks. Even in such regions there is a huge interest concerning mobile solutions. These systems make it possible to control the influx of visitors and give them simultaneously the feeling of an individual interaction when planning the weekend trip.

ENVISAGED IMPROVEMENTS

The prototype is not completed yet. Especially the range of functions has to extend. The upgrade with the three-dimensional view with a free selectable section is one of the milestones. The development of the XML-Parser, realised specifically in a basic version for the mentioned project, is very important. It has to detect more tags of the WMS-Specification. This is not fully implemented at this time. Through more tests volume of the data transferred has to be analysed and methods to be developed how it can be reduced.

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