

# Mobile 3D Viewer

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## German Abstract

Zweidimensionale Karten – sowohl in Papier- als auch in elektronischer Form – werden aktuell verwendet, um sich an einem unbekanntem Ort zu orientieren oder den Weg von einem Ort zu einem Zielort zu finden. Hierbei entsteht bei zweidimensionalen Karten das Problem, dass sie typische Orientierungspunkte der realen Welt wie weithin sichtbare Gebäude oder andere markante Objekte nicht hervorheben und somit einen direkten Vergleich mit der realen Blickrichtung nicht ermöglichen. Um diese Probleme beim Zurechtfinden in einer fremden Umgebung zukünftig zu vermeiden, wurde der Mobile 3D Viewer entwickelt, welcher es ermöglicht, dreidimensionale Geometrien, Stadtmodelle und 3-D-Karten auf ein handelsübliches Mobiltelefon zu laden und auf diesem darzustellen. Durch die realitätsnähere und somit für den Menschen leichter verständliche Darstellung wird es dem Nutzer des Mobile 3D Viewer ermöglicht, positionsabhängig eine intuitiv verständliche Karte auf seinem Mobiltelefon angezeigt zu bekommen und somit schnell und einfach zu seinem Ziel zu finden. Die Architektur des Mobile 3D Viewers erlaubt es zudem, zusätzliche ortsbezogene Informationen wie Hotels, Restaurants, Fahrpläne oder multimediale Informationen mit der dreidimensionalen Kartenansicht zu verknüpfen und somit dem Nutzer ein intuitives Navigations- und Informationswerkzeug zur Verfügung zu stellen.

## 3D Map Visualization

Currently, visitors of an unknown place are using two-dimensional maps, either as a paper map or as an electronic map on a mobile device, to find their way from a present position to a desired destination. While these maps are indeed able to give a rough survey of a large area, they are often insufficient for orientation in a smaller area, as the line of sight can not directly be deduced from a two-dimensional map. Objects of the real world used typically for orientation, like a high-rise building or other distinctive and prominent objects, are normally not visualized in two-dimensional maps, making it a problem to decide in which direction to go. Especially in areas without road signs, in countries where a visitor is

unable to read the signs, or inside of an unfamiliar building, like an airport or a shopping-mall, informational needs, such as the current position and the direction to go, are hardly deducible from a two-dimensional map. This will lead to problems in finding the way to a desired point.

The Mobile 3D Viewer directly addresses these problems, as it provides three-dimensional and freely navigable maps on standard mobile phones. Using a three-dimensional presentation, which is closer to reality than a two-dimensional map, enables a more intuitive handling and understanding of the map. Prominent buildings, so-called landmarks, are included in the map as realistic representations to facilitate orientation, and way-finding infor-



Figure 1: Mobile 3D Viewer with visible route representation.



Figure 2: Three-dimensional icon representing the current position of the user.

mation, for example »Go upstairs«, can be easily recognized in the three-dimensional visualization. The 3D map and the included objects can be either stored locally on the mobile device or be downloaded dynamically using standard technologies like 2.5G or 3G with consideration of the user's current position.

The visualization of different levels of detail enables the users to adapt the map representation to the current situation and their informational needs. Objects which are important for a user in a specific situation can be highlighted visually, thus making them easily recognizable in the map. For example, to display a route from a specific point, like the current position of the user, to a desired destination, objects of high importance to the route are visually accentuated, while surrounding buildings are shown in a lower level of detail by using simple representations like bounding boxes. In addition, relevant points in the route, for example turning-points, are integrated in the map giving an overview of the route to follow. The possibility of using varying levels of detail also enables the transmission of large-area maps in

short time and with low costs for the user, and the presentation of maps with a high number of objects on a mobile phone in spite of its limited resources.

### Locating and Routing

As a mechanism which supports the user directly in finding his way from point A to point B, an interface to routing and locating services has been integrated. By integrating positioning sensors, like GPS-devices (integrated in the mobile phone or connected for example via Bluetooth), to locate an outdoor-user, or by using W-LAN or Bluetooth-signals to locate users inside of a building, the view on the map can be adapted to the position of the user in the real world, allowing an immediate answer to the typical question at an unfamiliar place – »where am I?«. As an additional support to visualize position, a three-dimensional icon representing the user is integrated in the map.

The current position of the user not only affects the current map-view but also supports the user in a second typical task at an unfamiliar place, namely, finding the way from his current position to a desired location. For this, the Mobile 3D Viewer allows the sending of a routing request to an external routing service where complex routing algorithms are processed and sent back to the mobile device. In the Mobile 3D Viewer, the calculated route is visualized as a line with waypoints as well as an animation showing the route the user should follow. In contrast to statically pre-rendered videos, this animation can be paused by the user, allowing him to freely navigate inside of the map at that point to gain an overview of the currently shown position.

### Integration of External Information

Like in regular navigation-systems or two-dimensional maps, so called Points of Interest (POIs), like restaurants, hotels or train stations, are represented in the 3D map as symbols, allowing an intuitive identification of these objects even when their relevance is not deductible from the

geometrical appearance of a building. By animating – for example rotating – these symbols, the user's attention is focused on these POIs, making them easy to find on the map. Due to the modular architecture of the Mobile 3D Viewer, the POIs represented as symbols inside of the map can be linked to different information sources, like external web services or databases containing additional multimedia information. This enables the user to select a specific POI and retrieve additional information which initially is not included in the map, like the schedule of a public transport service or the opening times of a restaurant. In addition, the Mobile 3D Viewer can be used as an interactive tour-guide, for example to show videos with historical facts about a town or three-dimensional reconstructions of historical sites.

### Mobile 3D Viewer Version 2

Based on evaluations of the Mobile 3D Viewer, an advanced version has been recently developed, offering a menu-based selection of Points of Interest as well as improved possibilities for navigating inside of the map and for selecting the current view. So, depending on the users needs, the position inside of the map can be changed by simply selecting between different cameras showing, for example the current view of the user or a birds-eye-view giving a larger overview of the location around the user.

### Note

Mobile3DViewer will be presented on the Fraunhofer-Forum (see page 33-34) at the CeBIT 2007.

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