

Supporting Hikers' and Cyclists' Mobility by 3D GIS

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Introduction

The CityServer3D technology of the Fraunhofer department Graphic Information Systems (GIS) serves as a system for 3D GIS solutions as well as a supporting system for navigation and mobility purposes. In combination with standard services the Internet-based server provides value-added services for several end user groups. In research and development projects, extensions have been realized which allow the generation, manipulation and management of routes. The output of routes is accomplished by graphic content and also by XML-based data which can be easily processed by connected systems.

CityServer3D

The department Graphic Information Systems of Fraunhofer Institute for Computer Graphics Research has developed the CityServer3D system to implement new concepts and mechanisms for 3D GIS in current and future research projects. Due to its architecture, the CityServer3D provides a functionality easily extensible by new modules. Based on a three-tier model, the system provides intelligent data sources and can be accessed by several service interfaces. The managed models are stored in a database, computed by server components and delivered to clients which can be 3rd-party clients or the third CityServer3D clients.

German Abstract

Die CityServer3D-Technologie der Abteilung Graphische Informationssysteme des Fraunhofer-Instituts für Graphische Datenverarbeitung IGD dient neben der Bereitstellung von zahlreichen Funktionen für 3D GIS wie beispielsweise die Auslieferung und Manipulation von 3-D-Stadt- oder Geländemodellen auch als unterstützendes System zur Navigation und Mobilität. In Kombination mit Standarddiensten liefert das internetfähige System Mehrwertdienste für den Endanwender. In Projekten wurden dafür Erweiterungen in den Server eingebracht, welche es erlauben, Routen zu generieren, zu managen und zu manipulieren. Die Ausgabe der Routen erfolgt sowohl in graphischer als auch in XML-basierter Form, welche dann leicht von weiteren Systemen weiterverarbeitet werden.

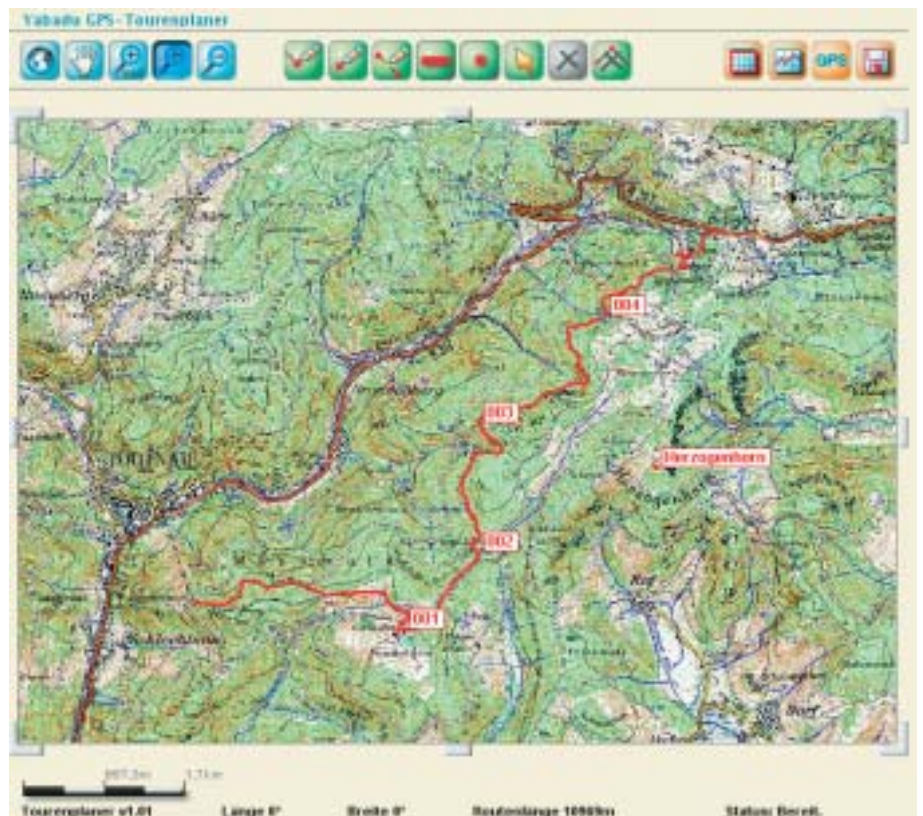


Figure 1: AuthoringTool for route definition and manipulation.



Figure 2: Showing 3D visualization for cyclists.

The CityServer3D consists of several components which together form a system to visualize, manipulate and handle 3D spatial data, like city and digital elevation models. The system is serving as a technical platform to realize solutions for different application scenarios like tourism, navigation, risk management, decision support systems or urban planning.

Route Extensions

To support mobility for travelers like hikers or cyclists, the CityServer3D was extended by three components which enable users to store routes and to extend them to travel guides. Three different user groups (roles) are using the system. Firstly, the data administrator has to maintain the stored models which are mainly routes, two dimensional vector-based mapping data and digital elevation models. Secondly, so-called authors use the system to generate, define, import and store routes which are part of travel guides. Thirdly, end users are browsing in travel guides and are provided with the functionality to buy interesting guides.

For the realization, the travel portal had to be extended by the CityServer3D. Therefore, the travel portal (as a guiding system) fulfills the func-

tions to store the guides as a whole and to provide the user interface. The CityServer3D is acting as a server for the travel portal and its communication via HTTP and by using secured authentication mechanisms. Routes are generated, imported and managed within the CityServer3D. They are transferred to the portal via an XML-based description which consists of route, waypoints, Points of Interest and segments as well as via PNG-graphics. These graphics are calculated via the CityServer3D components.

The authoring tool is realized as a Java applet which enables the author to manually generate a route or to import a route which was tracked on a GPS device, like the Garmin geko series. The new or manipulated route is stored in the CityServer3D system and is exported as XML, as an overview map, and as an altitude profile which can be controlled by several parameters. Figure 1 shows a sample profile and the usage of colors to show the gradients of route segments.

To calculate the profile, 2D routes are combined with a digital elevation model. Here, an elevation model from the SRTM (Shuttle Radar Topography Mission) is used. So, a

nearly worldwide coverage with a resolution of three arc-seconds can be achieved.

The authoring tool is part of the graphical user interface of the portal so that the CityServer3D system is not visible to the end users and authors. Figure 2 shows the user interface for the route manipulation.

Taking the CityServer3D to new applications can be easily achieved by extending the server's functions as shown in the presented solution. In the presented case, 3D GIS is used for calculations and for an easy integration of new mechanisms. 3D-based visualizations, based on this system, will be integrated in following versions.

Links

The department graphic information systems:

<http://www.igd.fraunhofer.de/igd-a5>

CityServer3D website:

<http://rioja.igd.fhg.de/CityServer3D>

Points of Contact

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