

3D CITY MODELS IN THE WEB-BASED 3D-GIS WWW.MAP2DAY.AT

K. Ulm, F. Steidler, X. Wang

CyberCity AG, Schaffhauserstr. 481, P. O. Box, CH-8052 Zurich, Switzerland - (kulm, fsteidler, xwang)@cybercity.tv

ABSTRACT:

Map2Day is a web-based 3D-GIS service which provides user interaction between 2D city maps, 3D visualizations and query based information. As a marketing tool, it allows organizations to present their services and products via the internet and shows their physical location in both a 2D and 3D format.

Queries can be run on the GIS database by selecting a category (e.g. tourism, public health etc.) and a group (e.g. hotels, golf courses etc.) from the query window. Additional user requirements are met by having area/distance measurement capabilities, support for 12 languages, and individual customization of the interface appearance allowing for different color schemes.

The relation between the 2D map, and the free navigation 3D visualization is updated dynamical. The queried Points of Interest can be approached automatically with smooth flight in the 3D environment, which consists of high resolution imagery, Digital Terrain Models and 3D city models.

1. INTRODUCTION

The web-based 3D GIS www.map2day.at was developed as a marketing tool for tourism and targeted to fill the gap being a powerful and useful 3D city map among lots of 2D web-solutions.

As tourist regions are consolidating more and more to be powerful in the market, Map2Day supports to merge tourist regions to a supra-regional tool for marketing in the tourism branch (Figure 1). GIS data can be integrated comprehensively.



Figure 1. Supra-regional start page for Austria.

The hotel and restaurant industry can present their products and services on the world wide web and can manage the content they want to present (e.g. special events, web-page, multimedia information etc.) on their own using an administration tool. Additionally, the interactive visualization of high-resolution imagery and DTM and highly detailed and realistic textured city models in the third dimension makes the solution not only more useful because of an improved orientation for visitors, but also very attractive for new tourists that are unaware of the region.

The solution www.map2day.at was developed in the year 2004 and uses ArcIMS and interfaces to TerrainView-Web (ViewTec AG) for 3D visualization. The solution was honored with an ESRI award for "Best

software Integration Map" at the Map Gallery at the ESRI International User Conference 2004.

2. MAP2DAY IN GENERAL

Flexibility and global usage is fulfilled by allowing the change of the appearance (color) and the support of more than 12 languages.

Targets from different categories (e.g. restaurants & entertainment, tourism & accommodation, culture & public institutions, public health, traffic etc) can be searched using the "Where is..." search based on the categories and groups (Figure 2). If the address of a particular target is known, the object is located by entering the address and shown in the 2D map. In addition to the geographic location, information like address, web-page and multimedia links are displayed. The companies that are linked to the address can manipulate the information that should be displayed using an online administration form and their username and password and can flexibly change and update information, for example in case of special events or special offers.



Figure 2. Display of result after search based on the category.

Every category is divided in several groups. E.g. Culture and public institutions consists of fire brigade, ambulance, church, university, post office, museum etc, the category "Traffic" contents train stations, airports, parking lots, petrol stations, bus stops etc. For every group, a graphic icon is assigned (Figure 3), which can be displayed in the 2D map (as well as in the 3D environment). These icons are linked with the appropriate web-page which allows the tourist/user to book rooms in a hotel, to find out about opening times of shops or pharmacies, or to learn more about events like football games, concerts etc.

Culture and public institutions		Sports and leisure	
fire brigade	police	tennis	soccer
ambulance	post office	golf facilities	mini golf
church	office	hiking way	cycle way
public library	school	way for mountain biking	nordic-walking
university	kindergarden, the care of children	skating park	beachvolleyball

Figure 3. Excerpt of graphic icons assigned to several groups from categories.

To bring people together after defining a meeting point, one can send an e-mail or a weblink showing the meeting point in the map and make an appointment at the corresponding location. Using an INFO button, information about certain objects like buildings, streets etc. from the GIS database can be displayed. Measurement functionality for length, segment and area measurements is provided.

3. INTERACTIVE 3D VRGIS

Map2Day is allowing to view the whole environment also in the third dimension which helps people to orientate and recognize locations. The 2D city map is linked with the 3D visualization, which means that you can easily navigate through the area that you are viewing in the 2D map or in the opposite, navigating to a Point-of-Interest in the 3D visualization and then displaying in the 2D map at which location you are in the 3D window (Figure 4).

Points-of-Interest are interesting locations that are stored in the GIS database and can be selected in a list and approached automatically with a smooth flight in the 3D environment.

As in 2D, graphic icons are displayed and linked to web-pages or multimedia information.



Figure 4. Interaction between 2D city map and 3D visualization.

For the 3D visualization of the landscape, high-resolution aerial imagery and a Digital Terrain Model (DTM) are required. Additionally to standard orthophotos, for the winter tourism region aerial imagery taken in winter were integrated which helps to recognize the landscape during winter time (Figure 5).



Figure 5. 3D representation of winter time for tourism.

In addition to the winter appearance of skiing regions in Map2Day, also GIS data of ski slopes are used which helps the tourist to get an impression about the extent and character of the ski region (Figure 6).



Figure 6. Ski routes as polylines or polygons.

Besides tourism, Map2Day is also used for public information and decision making in case of planning projects. To present a planned by-pass street and to get an impression about the visual impact on the natural

landscape, the street was integrated in the terrain and visualized including detailed bridges, tunnels and other street furniture (Figure 7).



Figure 7. 3D representation of streets, bridges, tunnels and street furniture.

4. 3D CITY MODELS IN MAP2DAY

Reality-based 3D city models by CyberCity are also displayed in Map2Day and thereby streamed over the internet.

For Salzburg (Figure 8), about 1'500 detailed building models of the city center were generated using a semi-automatic feature extraction from stereo aerial imagery (photogrammetry). The facades and roofs of the buildings were automatically textured using oblique aerial photographs taken from a helicopter by FMM GmbH. Including the high amount of textured buildings, the huge 3D city model was processed and optimized for the streaming via the internet.



Figure 8. Reality-based 3D city model of Salzburg (Austria).

If 3D city models like the one of Salzburg are included in the 3D visualization, using a True-Orthophoto as terrain texture is recommended (Figure 9) because only a True-Orthophoto guarantees that the 3D building exactly fits to its corresponding roof texture on the terrain. In a standard Orthophoto, the facades of the buildings may be seen on the ground covering the street because of the central perspective of the aerial images and the fact that only the Digital Terrain Model was used for the rectification of the aerial images.



Figure 9. Los Angeles True-Orthophoto (left) compared with Orthophoto (right). True-Orthophoto generation by CyberCity AG. Aerial images by Sanborn Inc.

In case of important landmarks like churches etc., detailed building models using terrestrial laserscanning or close-range photogrammetry are integrated to improve the appearance (Figure 10).



Figure 10. 3D Landmark (© HarmanBecker)

5. ACKNOWLEDGMENTS

The web-solution www.map2day.at was developed in a cooperation between CyberCity AG (Zurich, CH), Forest Mapping Management (FMM) GmbH (Salzburg, AT) and ViewTec AG (Zurich, CH).

6. REFERENCES

Gruen, A., Steidler, F., Wang, X. 2002. Generation and visualization of 3D-city and facility models using CyberCity Modeler. MapAsia 2002, Bangkok, August 2002

Ulm, K. 2003 Reality-based 3D city models with CyberCity-Modeler (CC-Modeler™) and laserscanner data. Optical 3D Measurement Techniques, 22-25 September 2003, ETH Zürich.

Steidler, F., Beck, M. 2004. CyberCity-Modeler - Generation, Updating and Continuation of 3D-City models with on-line-Editing - Visualization with TerrainView 2.0. CORP 2004.

Ulm, K. 2004. 3D-Stadtmodellierung mit dem CyberCity-Modeler. Digital Production 04/04, July/August 2004.

Ulm, K. 2004. Virtuelle 3D-Stadtmodelle - Technologie und Anwendung. GeoBit 8-2004, August 2004

Ulm, K. 2005. 3D City Models from Aerial Imagery - Integrating Images and the Landscape. GEOInformatics, Volume 8, February 2005.

7. AUTHOR INFORMATION

Primary Author:
Dipl.-Ing. Kilian Ulm
Sales & Marketing
CyberCity AG
Schaffhauserstrasse 481
PO Box
CH 8052 Zurich
Switzerland
Phone +41 44 300 13 44
Fax +41 44 305 77 00
E-Mail kulm@cybercity.tv

Co-Author:
Dr.-Ing. Franz Steidler
Managing Director
CyberCity AG
Schaffhauserstrasse 481
PO Box
CH 8052 Zurich
Switzerland
Phone +41 44 372 03 43
Fax +41 44 305 77 00
E-Mail fsteidler@cybercity.tv

Co-Author:
Dr.-Ing. Xinhua Wang
Head of R&D
CyberCity AG
Schaffhauserstrasse 481
CH 8052 Zurich
Switzerland
Phone +41 44 372 03 43
Fax +41 44 305 77 00
E-mail xwang@cybercity.tv

<http://www.cybercity.tv>