

3D LANDMARKS ON THE INTERNET

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Abstract: *The paper presents creations of 59 3D-models of 48 important landmarks in the South Moravian Region. The work has been done by Blom Czech Republic together with Control System International. All the models have been created in a way that makes them suitable for integration into an Internet environment. These fantastic landmarks include iconic buildings, such as Bítov, Vranov nad Dyjí and Spilberk castles along with the Valtice, Milotice, Mikulov chateaus and Lednice-Valtice Area, which is listed on UNESCO World Heritage list. The paper briefly describes used methods of data capture with short comparison of their possibilities and focuses on introduction of new features and possibilities of presentation in 3D on the internet. Geoserver BlomURBEX™ is presented with its structure of services, applications and included data sets. New versions of BlomURBEX™ applications BlomDESKTOP Viewer™ and BlomWEB Viewer™ are introduced with their features of sharing, displaying and working with 3D data. This new features bring possibilities to work simultaneously with different data set as raster data (ortophotos, aerial oblique images, raster maps), vectors and point clouds in 3D. Short description of BlomURBEX 3D™ and its data model BlomLANDMARKS™ related to the cultural heritage are indicated.*

1. INTRODUCTION

Development of information technologies brings new opportunities to share, view and work with 3D data not only in off-line solutions, but also on the Internet. This article aims to briefly present the project of 3D models of important objects of south Moravian region for the Internet, which was completed by Blom Czech Republic and Control System International s.r.o. In the second part, the BlomURBEX 3D™ geoserver is introduced. This geoserver was designed for effective display, sharing and work with 3D geospatial data, and it is the sister platform of the BlomURBEX™ geoserver.

2. 3D MODELS OF IMPORTANT OBJECTS IN THE JMK

In the first half of 2011, Blom Czech Republic together with Control System International s.r.o. began collecting data and creating 3D models of important landmarks in the South Moravian region suitable for presentation in the Internet environment. Blom used its extensive experience with creation of 3D models for the Internet, represented by its Blom3D™ product family that includes the BlomLANDMARKS™ subset. BlomLANDMARKS™ offers a higher level of detail than the standard Blom3D™ model, and it is typically applied to selected buildings such as major monuments, architecturally significant buildings and other points of interest. The Blom3D™ product family is designed to be as light-weight as possible, making it ideally suited for internet purposes. Blom has currently produced in excess of 1.000 BlomLANDMARKS™, complementing the offering of over 340+ cities modeled in Blom3D™ - all of which are also available in our on-line service platform BlomURBEX 3D™. The company Control System International s.r.o. guaranteed data collection and processing of terrestrial laser scanning, technologies with which they have great experience.



Figure 1. Detailed 3D model of Bítov castle (source <http://www.cyklo-jizni-morava.cz/3d-modely-vyznamnych-objektu-jmk>)

During the project "Creating of 3D models of important objects in the JMK region" 59 3D models of 48 significant buildings and sites in the South Moravian Region were created. Among others we can mention castles of Bítov, Vranov or Špilberk, palaces of Valtice, Milotice or Mikulov and also Lednice-Valtice area listed on the UNESCO world heritage list, and many others.



Figure 2. 3D models of fortified church in Kurdějov, Palace of Milotice, Porta Coeli abbey, Reistna part of Lednice-Valtice area listed on UNESCO cultural heritage list (source: <http://www.cyklo-jizni-morava.cz/3d-modely-vyznamnych-objektu-jmk>)

2.1 Methods of data collection

During the project, several methods of data collection and subsequent processing were compared. Among the methods were technology of oblique aerial imaging, classic geodetic methods and the method of terrestrial laser scanning.

2.2 Oblique aerial imagery

Blom group uses oblique aerial imagery - BlomOBLIQUE™ - as one of the inputs to create its Blom3D™ models of urban areas. Thanks to the fact that each object is covered by up to 12 different images with a typical resolution of 10 cm/px, this imagery can be used very effectively to extract photo realistic façade textures for the Blom3D™ models. Due to the inherent inaccuracies of aerial imagery, caused by the method of capture itself and the availability of suitable ground control data for the post-processing, the accuracy of the resulting models is in the region of 1 m.

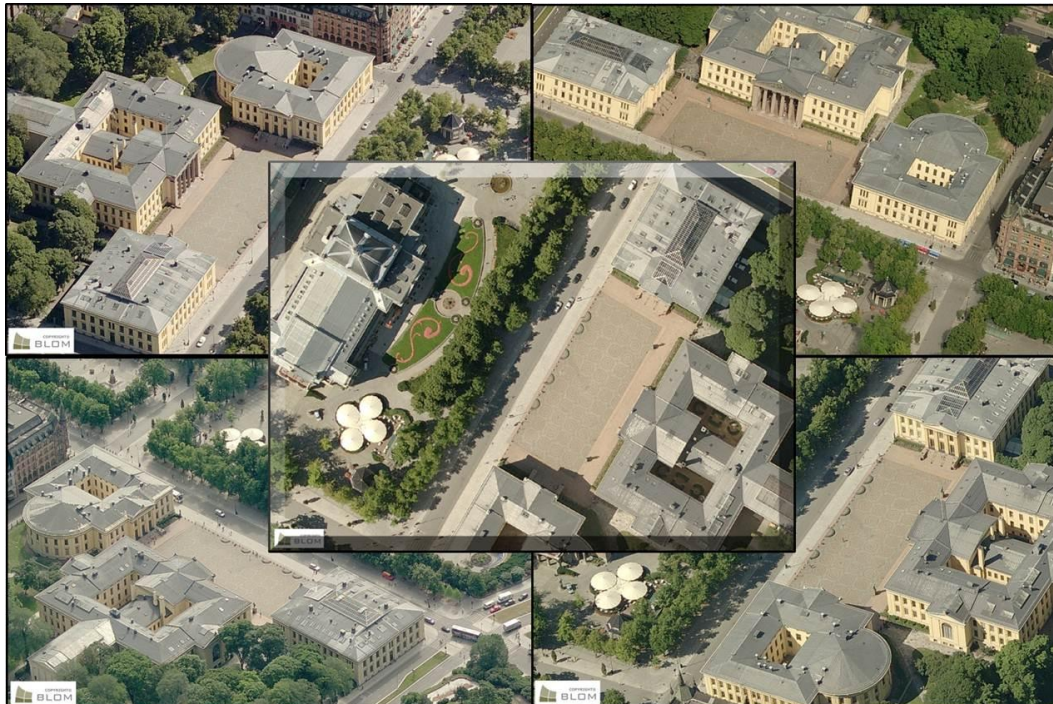


Figure 3. BlomOBLIQUE™

2.3 Conventional surveying methods

When using traditional surveying methods the object of interest is measured by a total station equipped with a reflectorless rangefinder. For texture creation, digital images of each individual façade are taken with a digital camera. Work is normally done according to detailed specifications. The advantage of this method is very accurate determination of size and shape of the object of interest and the ability to create highly detailed textures from the images of each façade. Level of detail depends on the requirements, and has almost no limit. Accuracy of the model ranges from the order of several millimeters to several centimeters.

2.4 Terrestrial laser scanning

During comparison of used methods great experiences of Control System International s.r.o. with collection and processing of terrestrial laser scanning data were proven. Terrestrial laser scanning is a non-selective method, allowing collecting of a large volume of accurate spatial data. Object of interest is captured in the cloud of points containing millions of points with 3D coordinates. This method provides a very complex data with an option of subsequent detailed processing. Level of detail is

similar as for conventional surveying methods and depends on the requirements for the 3D model. Accuracy of the resulting model, depending on the scanner varies from a few millimeters to several centimeters.

2.5 Comparison of methods

All of the above mentioned methods are complementary between them. The key to providing high-quality data suitable for the Internet is to combine high resolution, high accuracy landmark objects with medium resolution, medium accuracy but large area city models to create an optimal viewing and navigation experience. If the models are not light enough, they will not run efficiently on a standard computer. For the JMK region building landmark project, a conventional surveying method was chosen in order to meet the required accuracy, quality of texturing and level of detail. Thanks to chosen method of production of the landmarks, and Blom's experience in creating light 3D models for internet environment, only a small amount of data had to be processed.

| Method | Oblique aerial images | Conventional surveying | Terrestrial laserscanning |
|--------------------------------|--|---------------------------------|--|
| Level of detail | After data acquisition | Before measuring | After data acquisition |
| Capture of detail | Tens of cm | Units of cm | Units of cm |
| Final accuracy of the 3D model | Approx 1m | mm to cm | mm to cm |
| Advantage | A complex method for creation of 3d models of whole cities | Very detailed and accurate data | Very detailed and accurate data |
| Disadvantage | Costs, large amount of unused data , processing | - | Volume of the data, processing, large amount of unused data |

Table 1. Comparison of tested methods of data acquisition

2.6 3D models in the Internet environment

The display of a 3D model in the Internet environment poses certain requirements on the level of detail, n° of polygons, texture resolution, etc., in order to achieve optimum quality/performance ratio. In general, the focus is on the visual aspect of the model. With this focus however, a large portion of the collected data remains unused. Another problem is the possibility of effective presentation of such a model. One possibility is to use a well-known, public geoserver like Google Earth™. Unfortunately, this allows only limited possibilities to work with the data. Another option is to use the 3D web services of a commercial GIS software, which means a considerable cost not only for the software, but also for the hardware required for its operation. The Blom group offers not only the creation of highly detailed and photo realistic 3D models, but also offers an effective way how to share, view and work with large amounts of data taken during the creation of these models such as aerial images, oblique aerial images, vector data, point clouds etc. in an on-line environment via their proprietary geoserver platforms BlomURBEX™ and BlomURBEX 3D™.

2.7 BlomURBEX™ and BlomURBEX 3D™

BlomURBEX™ and BlomURBEX 3D™ are two unique geoserver platforms which has been developed to provide online access to all types of Blom products, as well as geospatial data in general. The geoserver is composed of layers of applications, services and data. The data layer is a revolutionary data set of high-resolution aerial images, high-resolution oblique aerial imagery, raster data, 3D models, vector data and a newly also panoramic images of mobile mapping and laser scanning point clouds. Individual data types are divided into data models:

- BlomORTHO™ - high-resolution true orthophoto maps and orthophoto maps with coverage of a large part of Europe, including national coverages of several countries.
- BlomOBLIQUE™ - oblique aerial images of thousands of European cities, covering 80% of the population of WE.
- Blom3D™ - 3D models of more than 340 cities worldwide, available in four levels of detail, complemented by detailed 3D models of important buildings and monuments in the subset of BlomLANDMARKS™
- BlomHISTORICAL™ - historical data such as aerial images, etc.



Figure 4. Blom3D™ model of the city of Ghent

The service layer includes BlomURBEX™ for 2D data and BlomURBEX 3D™ for 3D data. The services allow access to the geospatial data, regardless whether it is Blom data or content provided by our partners. The platforms are accessed via application programming interfaces (API) for custom development of tools and implementation in a variety of existing software platforms, as well as via software development toolkits for desktop and mobile platforms. A number of plug-ins for all common CAD and GIS software are also offered which enable easy implementation of BlomURBEX™ into already established workflows.

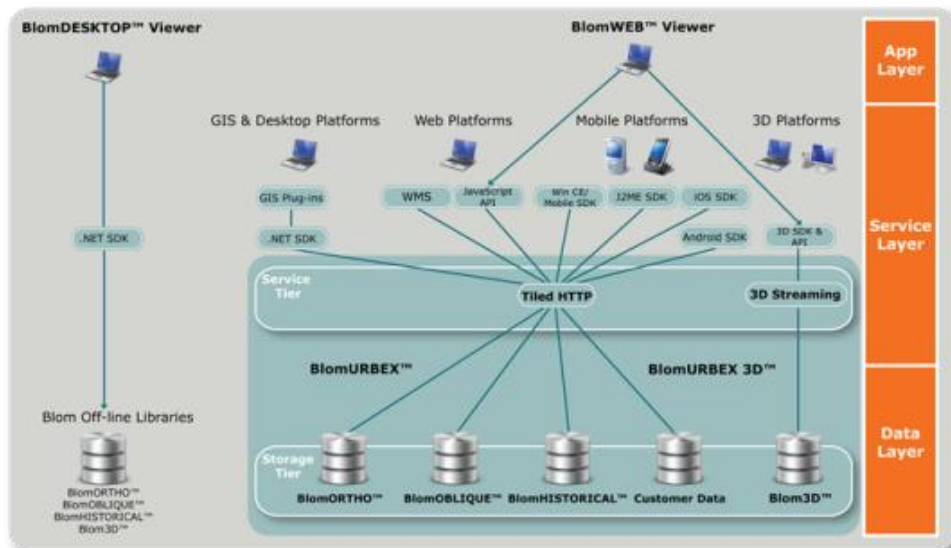


Figure 5. Schematic of BlomURBEX™

The last layer is the application layer, represented by BlomDESKTOP Viewer™ (off-line and on-line) and BlomWEB Viewer™ (on-line). These viewers allow you to quickly and efficiently display the data and work with them. Both viewers follow a detailed product roadmap with quarterly releases, and at the end of September 2011 a new version will be released for both viewers with capability to display our new BlomSTREET™ product - panoramic images taken with mobile mapping technology – and also all kinds of LiDAR point clouds from both aerial and terrestrial laser scanning.



Figure 6. BlomLANDMARK™ model of Notre Dame cathedral, Paris

3. CONCLUSION

BlomURBEX™ and BlomURBEX 3D™ offers customers the ability to quickly and efficiently view, share and interact with geospatial data of various types, ranging from image raster data and vector maps to panoramic mobile mapping images and LiDAR point clouds in 2D or 3D – all of it accessible

online or off-line using all commercially available desktop and mobile platforms. With this technology it is possible not only to work with 3D models of objects of cultural heritage, but also use and work with large amounts of data that are taken during their creation.

References

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