



A touch table enabling the public to view 3D scenes of Stockholm

A TOWN ON YOUR TABLE TOP

THE CITY OF STOCKHOLM WANTED ITS CITIZENS TO BE AWARE OF FUTURE URBAN PLANS. WITH A COMBINATION OF IMAGERY, MAPPING AND OTHER DATA SOURCES, IT WAS ABLE TO CREATE A 3D INTERACTIVE, TABLE TOP MODEL. AUDE CAMUS EXPLAINS HOW

In an era where information technologies are omnipresent, citizens want to be aware of the future urban plans of their city. With regard to this demand, in 2013, the City of Stockholm launched a new project intended to create the most realistic 3D model ever of the city, covering over 500 square kilometres in size and integrating virtual 3D mockups of future architectural and infrastructure projects. Citizens would then be able to visualise and navigate the resulting 3D model on interactive touch tables.

Blom Sweden was already an historical partner of the City of Stockholm, and presented an innovative solution based around its BlomOblique imagery library and Acute3D's software that would allow them to automatically producing high resolution, photorealistic 3D models from simple photographs.

This project, involving five people, started in July 2013 and took one year to be implemented: two months were necessary for the image acquisition, three months for the production, and about six months to deal with technological challenges.

Technological challenges

To produce the 3D city model at the required precision and in the allotted time, Blom benchmarked a set of competitive solutions and selected Smart3DCapture from Acute3D. "The choice of Smart3DCapture software was made mainly due to performance proven by references and available demo data, with transparency regarding project setup, which helped us to easily conclude that we could make full benefit from our oblique imagery," says Hans Strandberg, senior project manager at Blom Sweden.

Working together from October 2013, which is when the initial production really started, Blom and Acute3D designed an adapted production unit around the Ultimate Edition of Smart3DCapture, which supports an unlimited number of photographs as an input, and parallel computation to boost the processing.

One of the main challenges the team faced was to overcome the limitations of computer visualisation algorithms for reflective areas like water, which is found in many places in Stockholm. These algorithms can apply to points of correlation detected in several photographs



Example 3D view showing the model of the planned area “Northern City of Djurgården”, inserted into the existing environment.

‘looking’ at the exact same part of the scene, from slightly different angles, so might be confused by reflections.

Acute3D developed a new solution taking georeferenced polygons as constraints to automatically create water surfaces and connect them to the rest of the meshed model, without tedious editing or touch up.

Another challenge was to offer a smooth navigation experience through the gigabytes of the resulting triangulated mesh data, what was made possible thanks to the native tiling technology of Acute3D, smartly breaking down 3D models of any size into a pyramidal structure linking geometric tiles of different level of detail. This overcomes computer limitations for production, diffusion and navigation.

Conversions

BlomOBLIQUE consists of an extensive library of overlapping aerial photographs, acquired from five different directions, including nadir and 45° oblique high resolution photos at a resolution of 5-15cm per pixel.

From these photos and the metadata (position and orientation of the images) already available for Stockholm at the beginning of the project, together with the georeferenced polygons marking out the water areas obtained from different sources, including the high-resolution vector map, National Land Survey’s national low-resolution map and digitised aerial

photographs, Blom automatically generated an initial textured 3D mesh, cut into thousands of tiles with differing levels of detail.

Going public

The City of Stockholm evaluated several visualisation solutions for touch tables and web publishing. The main issue was to find a technology able to handle a huge amount of 3D data and enable a smooth navigation experience.

On the one hand, Agency9’s CityPlanner was chosen to generate the first teaser video and contemplated for the web diffusion of the entire city model. On the other hand, Acute3D adapted its export format to comply with Interactive Institute Swedish ICT’s touch table solutions. On large touch screens, visitors are invited to fly through the photo-realistic 3D model of Stockholm City and explore future infrastructure projects.

“Two of the visualisation tables are located in Kulturhuset and the exhibition I called The Stockholm Room exhibition. Here we can communicate with visitors about how the city grows and develops in a sustainable manner,” explains Elisabeth Argus, city planning manager of Stockholm City.

The 3D model is supplemented with information on planned and ongoing construction projects, and shows different aspects of how the city is growing. The permanent exhibition is supplemented by themed weeks, workshops,

meetings and press screenings. Topics include traffic, accessibility, environment, sustainable building and new construction projects.

A visualisation table with the 3D model is also used in The Dialogue Pavilion, which is a mobile pavilion placed temporarily in an area of the city where there are planned changes. For a few days, the mobile pavilion is accessible to all Stockholm residents, where it can be reached by as many people as possible. The pavilion is used in various stages of the planning process, so that the residents are kept informed and feel more involved in the city’s development.

There is also a couple of visualisation tables used both in the office and for temporary exhibitions, workshops and conferences, all showing the 3D model supplemented with current information on various topics.

“Visitors to The Stockholm Room and The Dialog Pavilion have appreciated the exhibitions and are pleased to be able to see how the planned projects will look in their area,” says Argus. “This modern way of displaying planned projects will appeal especially to a younger audience who might usually not seek to gain access to this type of information.

Conclusion

This project has been a success and there is an increasing demand for this kind of photorealistic 3D models, as the virtual 3D model is a key element in the decision-making process, as understandable by everybody. All the companies involved in this project have improved their technologies and knowledge, so this kind of project could be done from now in only few months. Indeed, since Stockholm, Blom has processed a handful of cities in Sweden including Malmö, Örebro, Eskilstuna, Borås, Kalmar, Boden, Visby, Norrköping and Sundsvall.

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3D views of Stockholm