partners, will influence the next generation of software and hardware development for optimal management of large interconnected systems.

The industry-driven case studies of real applications that are considered in the project include:

• The balancing and stabilizing of the electricity distribution grid of the city of Koprivnica that is a highly-automated complex system involving multiple electricity producers and consumers (households, charging stations of electrical vehicles, etc.)

• The dynamic management of charging of electric vehicles in the city of Malaga that involves the management of the network of electrical vehicles and power station with vehicle-to-grid charging capabilities.

• The energy management of a large chemical production site that seeks the right balance for an operation of the power plant (steam network) to satisfy the demands of the production subunits and to minimize the amount of imported energy resources.

• The cross-plant process management in an integrated chemical production complex. This case study is concerned with managing a network of parallel reactors that share a flare system and limited cooling power.

For the usability of the results, it is essential that the engineering, implementation and long-term maintenance of such advanced solutions are taken into account. The project will develop prototypical tools that facilitate development, testing, deployment and maintenance of these solutions. A key element of these engineering tools is an open simulation platform that enables dynamic management and control methods to be tested with accurate models of the overall system and the connection to external models that are available in the application domains.

The expected technical outcomes of the project are:

• Innovation in distributed management methods for complex interconnected systems,

• Progress in methods for the rigorous analysis and validation of systems of systems,

• Improvements in the management of electric grids and of large production complexes,

• Tools for the engineering of management systems for systems of systems,

• Identification of technology gaps in advanced management and coordination methods.

The developed coordination methods will lead to improved system stability and lower resource consumption in industrial production, and in electric power generation and distribution. This will result in a reduction of the CO2 emissions, increased competitiveness of European industry and lower prices for consumers. DYMASOS is thus contributing to the goal of a greener and more competitive Europe.

Link: http://www.dymasos.eu

Please contact: Sebastian Engell
Technische Universität Dortmund Germany
E-mail: Sebastian.Engell@bci.tu-dortmund.de

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3DHOP: A Novel Technological Solution for the Development of Online Virtual Museums

by Marco Potenziani, Marco Callieri and Roberto Scopigno

The interactive visualization of 3D content on the Web has gained momentum in recent years, thanks to the release of ad-hoc technology as part of HTML5. However, so far, few products fully exploit this opportunity for the easy and quick embedding of high-resolution 3D models in a Web page. 3DHOP (3D Heritage Online Presenter) is an advanced solution for easy publishing of 3D content on the Web.

3DHOP allows anyone with basic webpage-creation skills to setup an HTML page displaying a scene composed by high-resolution 3D models. This free tool is essentially a viewer that can stream and render effectively 3D data over the net, letting the user interact with high-resolution 3D content (see Figure 1). It is oriented towards the Cultural Heritage (CH) field, where the need to handle highly detailed digital representations of cultural artefacts is often mandatory; however, it may also be useful in other contexts requiring high performance and interactive visualization of high-resolution 3D content.

3DHOP has been developed by the Visual Computing Lab, ISTI-CNR, in the framework of several EU projects addressing the management of large collections of 3D digital models: the EC IP project ”3DCOFORM”, the EC NoE “V-Must” and the EC pilot project “3D-ICONS”. It is the result of 10 years of R&D focused on the design and implementation of easy-to-use tools that enable CH professionals to present, visualize and enrich high-quality digital 3D models (the first important result of which was the Inspector system [1]).

The rationale underlying 3DHOP was the lack of tools to manage the interactive visualization on the Web of high-resolution 3D geometries in a simple way. While there are various products (both free and commercial) that can re-create complex virtual scenes made of simple 3D entities, they are not suitable for the management of complex 3D geometry,

Figure 1: A collection of 3D models presented with 3DHOP (an example of layout)
With 3DHOP, we hope to offer a novel and versatile solution for publishing 3D content on the Web, facilitating deployment and access to high-resolution 3D resources by non-experts in 3D programming. This new technology, particularly suitable for Online Virtual Museums, should encourage the global dissemination and deployment of high-quality 3D cultural heritage content via the Internet.

Links:
3DHOP: http://vcg.isti.cnr.it/3dhop
Nexus: http://vcg.isti.cnr.it/nexus
SpiderGL: http://vcg.isti.cnr.it/spidergl

References:

Please contact:
Marco Potenziani, Marco Callieri, Roberto Scopigno, ISTI-CNR, Italy
E-mail: marco.potenziani@isti.cnr.it, marco.callieri@isti.cnr.it, roberto.scopigno@isti.cnr.it

3DHOP can be used by anyone with simple webpage-creation skills, without the need for specific CG expertise; the goal was to be easy-to-use and easy-to-learn. For this reason, 3DHOP uses general web programming mechanisms (declarative programming). The various components of the visualization page (the 3D models, the Trackball, the Canvas, the Scene) are treated like HTML entities in the same way as the rest of the structural elements of the web page, and are declared and customized using simple parameters. A developer can just pick a starting example and modify it by simply changing some parameters of the entities (see Figure 2).

3DHOP has been created using standard Web technologies (like JavaScript and HTML5), without relying on external components; it can run on all the most widely used browsers (Chrome, Firefox, Opera and soon IE) and all the principal OS (Win, Mac-OS and Linux) without the need for plugins. It must be stressed that although 3DHOP has been designed for the Web, it only needs a Web browser to work; this means that it can also run locally, to implement museum kiosks, for example. Unlike similar tools, the 3DHOP viewer is totally client side, and does not require a specialized server.

3DHOP currently supports two types of 3D models: single-resolution (PLY and soon OBJ) and multi-resolution (NEXUS). In particular, the multiresolution Nexus technology (another achievement of ISTI-CNR), supports the streaming of high-resolution 3D meshes over the HTTP protocol, enabling the exploration of very large models (millions of triangles, like in Figure 3) on commodity computers with standard internet connections. 3DHOP is based on WebGL (the standard API for the CG on the Web developed as the JavaScript equivalent to OpenGL|ES 2.0), and on SpiderGL, a JavaScript utility support library for WebGL (again developed by the Visual Computing Lab [2]), which provides an API with the typical structures and algorithms for real-time rendering in the development of 3D web applications.

The evolution of 3DHOP will be focused on the integration of visualization components for other multimedia layers, like images, audio, video, etc. Work is already underway for the management of large 3D terrains and RTI (Reflectance Transformation Imaging) images [3].