

UNIVIEW: A computer graphics platform bringing information databases to life

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Abstract

Uniview is a PC-based software platform for three-dimensional exploration of the Universe and the visualisation of information that is located at any position in this Universe, be it on the surface of the Earth or many light-years away from home. What began as a collaborative project with the American Museum of Natural History¹ in New York in 2003 has now evolved into one of the leading visualisation platforms for the planetarium and science centre market with customers in both Europe and USA.

Three key values

Uniview² is focused on three key values – usability, flexibility and scalability. These stem from a standardised mouse-driven user interface based on normal Windows components and a hierarchical object structure. Flight paths can be recorded and played back and events can be scripted using the built-in scripting language. Uniview can render frame-by-frame output to most standard formats in order to facilitate show production for fulldome, cinema or television. Using the power of the ScaleGraph technology Uniview can visualise data in many different scales, from earth science and regional GIS data to large scale structures and cosmology, increasing the usability of the display venue. Uniview can be run either on a single PC or by a large scale cluster solution. Also, the system allows for remote collaboration and shared experiences between display venues, schools and field experts, using the Octopus networking toolkit.

Key points

In this specific presentation we want to highlight two main feature sets – the support for GIS (Geographic Information System) data via the widely used KML format, originating from the Google Earth³ community, and also we have introduced a new volumetric model of our Milky Way galaxy.

GIS

We start by demonstrating a dynamic sunrise, possible thanks to an advanced atmosphere model coupled with high resolution Landsat⁴ satellite data and elevation maps (streamed via WMS⁵, Web

¹ <http://www.amnh.org/>

² www.scalingtheuniverse.com

³ <http://earth.google.com/>

⁴ <http://landsat.gsfc.nasa.gov/>

⁵ <http://www.opengeospatial.org/standards/wms>



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Figure 1 – Particle system Oort cloud 3D model in Uniview. Data from Tsunehiko Kato & 4D2U, NAO, Japan.



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Figure 2 – Volumetric Milky Way galaxy 3D model in Uniview. Data from Tsunehiko Kato & 4D2U, NAO, Japan.

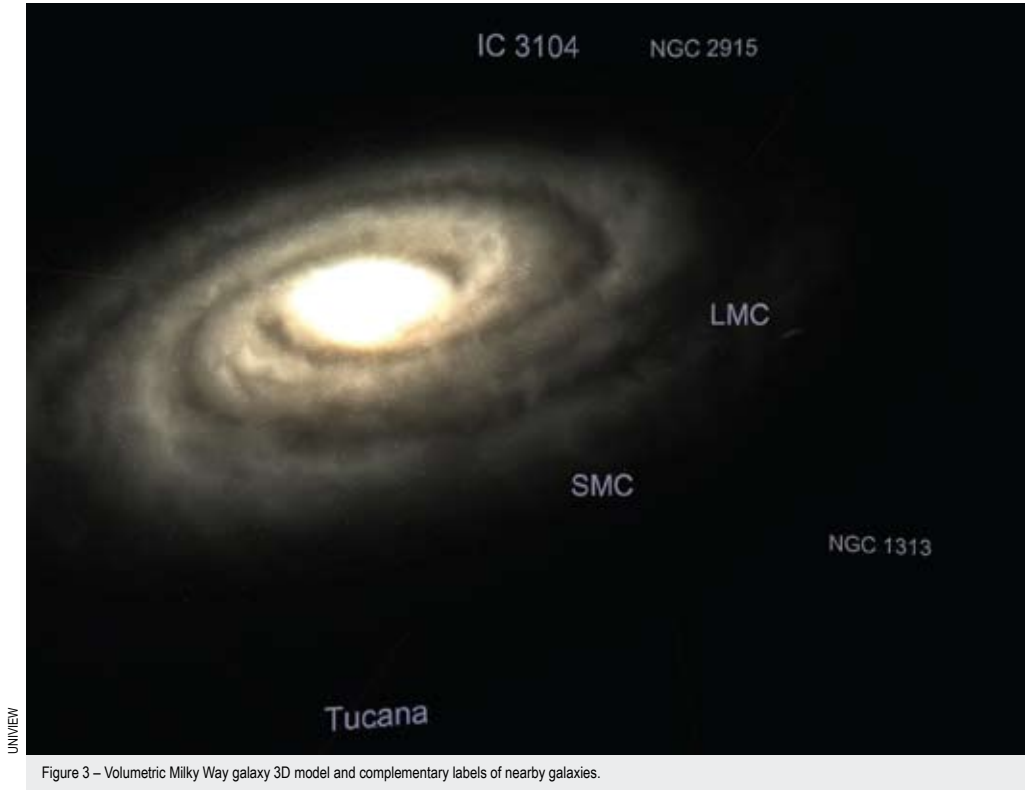


Figure 3 – Volumetric Milky Way galaxy 3D model and complementary labels of nearby galaxies.

Map Services), then time moves forward and the audience is taken on a journey from the Alps to Athens.

The next step is to show a dataset from Bolivia created by Marieke Dechesne at the Denver Museum of Nature & Science⁶. This data, outlining areas that were flooded in the plains of Bolivia during February 2007, is coupled with a general border outline of the country itself. Using the Landsat satellite surface textures we can also see where the river flows and draw immediate conclusions.

Next we invite Ryan Wyatt from California Academy of Sciences⁷ on stage to present GIS data created by his colleague Healy Hamilton; this data shows different scenarios of the habitat of a wolf in North America, where the scenarios are based on different models of future climate change.

⁶ <http://www.dmns.org/>

⁷ <http://www.calacademy.org/>

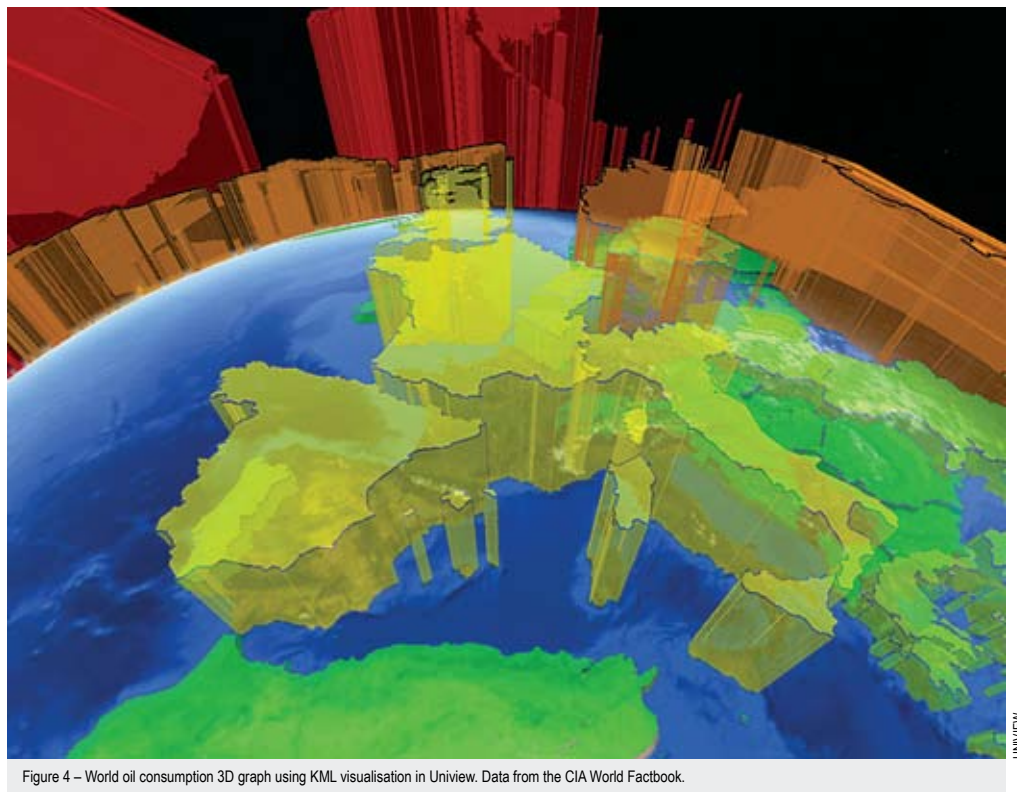


Figure 4 – World oil consumption 3D graph using KML visualisation in Uniview. Data from the CIA World Factbook.

Following this, we zoom out to watch a three-dimensional graph showing the oil consumption in the world today – this data is downloaded straight from the Keyhole bulletin board⁸ community where a wealth of KML datasets can be located.

Galaxy

Finally, we zoom out from the Earth into the Solar System and further out through the Oort cloud⁹, which is now visualised using an actual point cloud showing the distribution of the Oort cloud in space. As we get even further out using the logarithmic scale of Uniview, the actual parallax movement of the stars begins to appear and we soon exit the realm of the nearby stars.

This is where we reach the final destination of this demonstration; the new three dimensional, volumetric galaxy model, developed in association with Toshiyuki Takahei, based on a galaxy model by Tsunehiko Kato, 4D2U Project, NAOJ.

⁸ <http://bbs.keyhole.com/>

⁹ <http://solarsystem.nasa.gov/planets/profile.cfm?Object=OortCloud>