CUSTOMER SPOTLIGHT

Bibliotheca Alexandrina uses Avizo® to understand the Great Sphinx erosion

A textured model for Sphinx and the Giza Plateau.

BIBLIOTHECA ALEXANDRINA
مكتبة الإسكندرية

International School of Information Science

Computer Systems MERCURY VISUALIZATION SCIENCES

Bibliotheca Alexandrina uses Avizo® to understand the Great Sphinx erosion

The Great Sphinx is a monumental statue that is considered the first truly colossal sculpture in Egypt and a national symbol of both ancient and modern Egypt. The statue would have disappeared long ago had it not been buried under sand for so long. The statue is eroding due to the effects of wind, humidity and the smog from Cairo. Wind is one of the most critical denudation factors that are causing the erosion of the statue, especially when it carries dust.

In order to investigate the formation of the low speed wind over the Sphinx model, a simulation is made that involve solving the 3D incompressible Navier-Stokes equations on a several millions of points' computational mesh. This is a collaborative work between IBM and Bibliotheca Alexandrina based on research work conducted in IBM Center for Advanced Studies in Cairo.

The **VISTA team** Of **Bibliotheca Alexandrina** has implemented the visualization of the simulation results on the CAVE system using Avizo® to provide new insights and better understanding. Thanks to the calculation and visualization of complex algorithms, the researchers can see the invisible, understand the degradation of the Great Sphinx and present their result.

- Stream Ribbons
The CAVE system helped the scientists to study some phenomena, such as the secondary phenomena at the at corners and cavities of the left of the statue. It was not possible to study such phenomena using traditional methods.

- Line Integral Convolution (LIC) Algorithm
This algorithm is useful to visualize the shape of the air flow as well as the pressure values. This helps to emphasize the non-existence of dynamic load due to low speed northwest wind acting on the head.

- Illuminated Stream Lines (ISL) Algorithm
ISL Algorithm provides a 3D animated representation of the whole air flow field. The CAVE system allows the user to get immersed inside the ISL field, which gives better insights and hence understanding of it rather than the 2D screens.

- Vorticity
The vorticity magnitude (a measure of the friction stress) on the surface of the statue is visualized as color contours on the Sphinx surface. The Sphinx's weak areas, which are the left shoulder and the top of the hunches, are exposed to maximum wind friction. The back of the head and the top of the trunk are also considered vulnerable areas.

"The VISTA team has chosen Avizo because of its ability to display and manipulate meaningful graphics representations of natural phenomena. Using Avizo, VISTA is able to use advanced visualization techniques to understand complex simulation data."

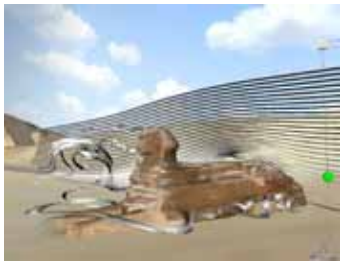
About VISTA

VISTA (Virtual Immersive Science and Technology Applications) is a project established by ISIS (International School of Information Science) in Bibliotheca Alexandrina. The aim of the project is to provide an interactive Virtual Reality environment that allows the researchers to transform numerical as well as two-Dimensional data sets into 3D simulations and step into them. The VISTA helps the researchers to simulate the behavior of natural or human-engineered systems instead of merely observing a system or building a physical model.

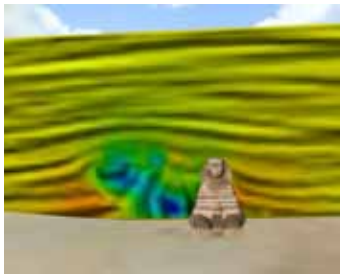
About Avizo®

Avizo® software is a powerful, multifaceted tool for visualizing, manipulating, and understanding scientific and industrial data. Wherever three-dimensional datasets need to be processed, in material sciences, geosciences, environmental science or engineering applications, Avizo offers abundant state-of-the-art features within an intuitive workflow and easy-to-use graphical user interface.

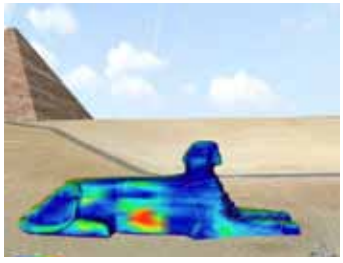
The VISTA CAVE System displaying 3D stereoscopic images in an immersive environment



The secondary Phenomenon visualized with Stream Ribbons



The LIC plane visualized both the air field shape and the pressure values using colors



Vorticity magnitude on the Sphinx surface is mapped to colors.

Contact information:

Bibliotheca Alexandrina
http://vista.bibalex.org
Vista@bibalex.org

Mercury Computer Systems
Visualization Sciences Group
mercury_vs@mc.com

Images courtesy: Bibliotheca Alexandrina, International School of Information Science (ISIS). Copyright of IBM Center for Advanced Studies in Cairo.

www.vsg3d.com