Customer Spotlight

Bibliotheca Alexandrina uses Avizo®
to visualize and 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 FLEX™ 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 FLEX™ system helped the scientists to study some phenomena, such as the secondary phenomena at the 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 FLEX™ 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.”

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