vl·e virtual laboratory for e·science

The Dead Cat

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Introduction

The aim of the *Virtual Laboratory for eScience* (VL-e) project is to bridge the gap between enabling technologies such as "The Grid" and a wide range of scientific application domains. VL-e will provide generic functionalities that support a wide range of specific e-Science application environments and set up an experimental infrastructure for the evaluation of ideas.

One of the six application domains in the VL-e project is on *Medical Diagnosis and Imaging*. In this public/private collaboration, a problem-solving environment is under development that will allow researchers to consolidate computational resources from interdisciplinary research areas for the development of new applications.

Shown here is an example: the interactive, co-located visualization of 3D medical data sets. In this case: a CT scan of a dead cat.

Augmented Reality

This demonstration augments objects in the real world with computer generated images, a technique that is therefore referred to as "Augmented Reality" (AR). The method that was developed for this demonstration combines object tracking, volume rendering software, accelerated graphics hardware and fast, low-latency networks to create the illusion that the display has opened a virtual window into a real object. In this case, the computer generated images represent a volume rendering of a large volumetric Computed Tomography (CT) scan that is rendered "co-located" onto the real object: a 100 year old panther conserved in a jar with ethanol.

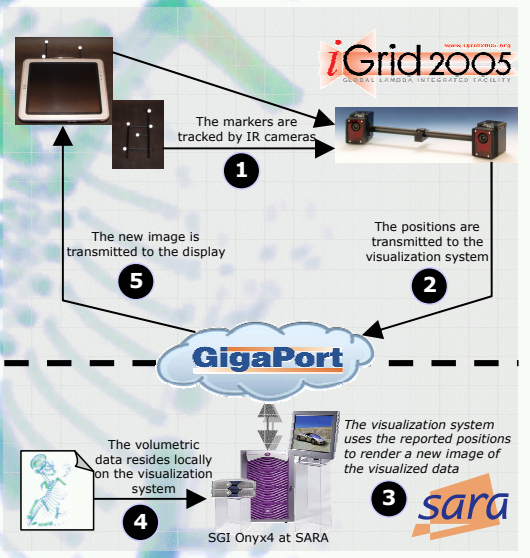
The co-located visualization of real objects together with their volumetric scans enables interesting new applications. Examples are found in image-assisted minimally-invasive surgery and non-destructive sample analyses. Apart from medical science, volumetric datasets are also generated in other scientific areas, including physics, biology and computational science. Additional application areas are expected within these areas.

High Performance Visualization on the Grid

The real-time volumetric visualization of large data sets is often beyond the capabilities of local computing resources. Although the performance of graphics cards has increased enormously over the last decade, they sometimes lack the features and power provided by professional solutions. However, the cost of these professional solutions when compared to the expected utilization by one institute often prohibits their use in a cost-effective way.

The Grid computing paradigm enables alternative ways to access these resources.

This interactive display uses the Grid paradigm to access high-performance graphics rendering engines. Based on the current position and orientation of the display, a volumetric rendering is computed on the remote computing site from a locally stored volumetric scan of the object. The rendered image is sent back to the display over a high-performance network so that it appears as if the display has opened a window into the virtual object.



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