Tiled displays for presenting high resolution datasets

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Introduction

- Viewing geometric datasets that require high resolution to resolve the structure.

- Exploring image data by being able to see detail and the context simultaneously.

Challenges

- All the data can't fit into available memory.

- All the data can't fit into graphics card memory.

- Processing performance precludes realtime interaction of all the data at once.

High resolution display options

- High resolution projector(s).
  Issue: High price tag, US$150K for single 4K projector.
  Requires four 4K projectors to achieve 32MPixels.

- Array of projectors. Can create an edge blended seamless display.
  Issues:
  - High space requirements.
  - High cost of ownership and maintenance.
    Especially for edge blending and colour calibration.
  - High resolution requires a large numbers of projectors.
    16 HD projectors required for 32MPixels.

- Tiled LCD panels with small bevels.
  Issues: Small bevels are still only exist in relatively low resolution panels.

- Optiportal: possibly large number of displays and multiple computers.
  Multiple computers is the only scalable approach.
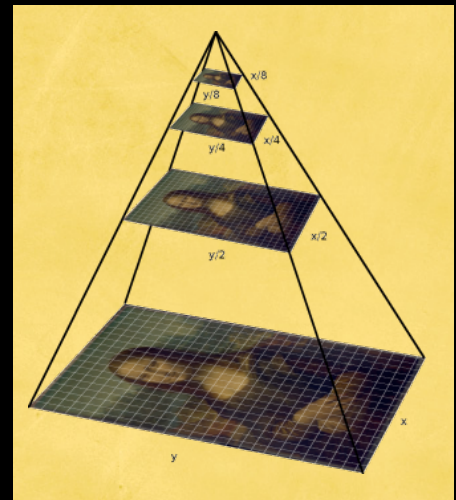 Issues: Limited software support.

Hardware

- Claim: To get raw pixel count, the 2560x1600 pixels of 30 inch DELL displays is the most cost effective solution. 8 panels results in 32MPixels.

- Hardware: Single workstation and two nVidia QuadraPlex units.

- QuadraPlex units result in 8 dual link DVI ports, SLI and genlocked if desired.
  Based upon the Quadro FX5800 cards.

- Driver support for MSWindows7 and a couple of Linux distributions.

- Has the the major advantage that any software can be used, appears as a single large digital canvas.

Software / data structure

- Brute force algorithms will eventually fail as the data size increases.
  Especially true for approaches that require all the data to be memory resident.

- Solution is to realise that the display (number of available pixels) limits the data that is visible and therefore limits what needs to be in memory.

- Scalable visualisation software becomes a data management problem.

- Need data structures that allow software to efficiently load just the data that is visible and at the appropriate resolution.

- Data can additionally be located remotely and accessed through client server model.
  eg: GoogleEarth, iiPImage, and others.

Examples

- Google Earth is an obvious example. Data is available in multiple resolution tiles and loaded as required depending on the zoom level.

- Pyramidal tiff image format.

- iiPImage: Client server based image viewer.

- vliv: "Very Large Image Viewer", a highly optimised pyramidal tiff viewer.

- DeepZoom from MicroSoft research.

- Challenge is to provide a similar solution for volumetric data.

Demonstration