

Advances in Visualisation

[Leveraging advances in other industries]

Paul Bourke
WASP, UWA

Advances in other industries that are influencing scientific visualisation.

- Technologies mostly targeting the entertainment industry.
- From proprietary software/hardware to commodity.
- Lower price point allows smaller institutions to support a wider range of visualisation infrastructure. It lets the larger centralised visualisation centers to grow their capacity to support the higher end problems.
- How can practitioners in the visualisation industry leverage advances in the much larger entertainment industry?
- Will consider three areas in particular:
 - Improvements in graphics cards ... performance and quality
 - High definition television ... increased resolution of displays/projectors
 - Gaming software ... collaborative environments and game engines

Graphics cards

- All aspects of graphics cards have been improving over the last few years.
 - Performance.
 - Texture memory.
 - Pipelines.
 - Standardisation of APIs.
- Lower price points in the commodity range.
- Ability to perform general purpose computing on the graphics card. Opportunities for closely coupled CPU/GPU solutions. (Visualisation in parallel with computation/simulation)
- This is most evident in volume rendering. There are a recently number of solutions for performing volume rendering in realtime.



Liver lobe - Drishti - ANU VizLab



Cortex - Drishti - ANU VizLab

Graphics cards

- Increased performance has allowed display/projection systems to be simplified.
- Realtime edge blending.
- Realtime image warping.
- Driving high pixel count displays. (Dual link DVI)
- Driving a higher number of displays from a single computer vs cluster. (PCI Express 2.0).



Realtime image warping: iDome - UWA



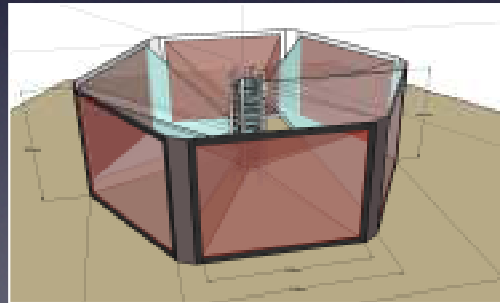
10,000 x 1600 pixel tiled display (UWA)

HiDef

- High definition television is driving display and projector manufacturers.
- HD (1920x1080) projectors for home cinema are quickly reaching the price point of XGA (1024x768) of 5 years ago.
- Large scale, high resolution display walls can now be built at a fraction of the cost.
- HD resolution digital support in video cameras and editing software.
- Commodity level stereoscopic displays replacing the CRT technology of the past.



IHPC Singapore (Model: Earth and Geographical Sciences, UWA)



Proposed new VROOM environment (Paul Bourke, 2008)

HiDef

- Higher resolution projectors are greatly simplifying many immersive environments.
- One can now get higher resolution using fewer projectors which in turn normally implies fewer computers and much lower software complexity.



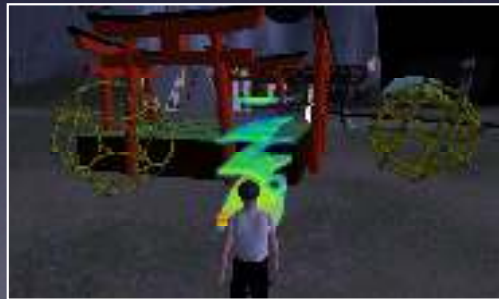
Immersive molecular visualisation (UWA)

Gaming software

- Can multiplayer games provide a platform for collaboration between remote researchers?
- A number of options currently exist where one can import datasets, represent that data visually (visualisation) and then discuss (text, voice, video conference) with remote collaborators all within a virtual environment.
- In the past this would require custom software and hardware solutions.
- Lots of applications as a teaching and presentation media.



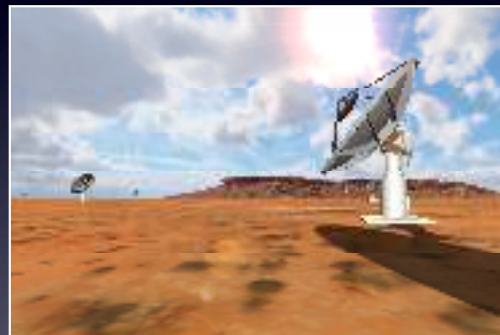
MWA site panorama. (Photography: Peter Morse)



Volume visualisation of fluid flow. (Paul Bourke)

Gaming software

- Gaming industry is maturing and there are now game development systems. Can now concentrate on the task/problem at hand rather than writing low level software.
- Can gaming development systems be used to create a richer, more engaging visualisation experience?
- Many (most) visualisation tools were designed/written in an era before some of the capabilities of current cards existed.
- Current games exploit the capabilities of current cards and thus tend to give a richer visual experience.



ASKAP telescope arrangement (UWA)

Visualisation that
Integrates / exploits multiple senses.

Stereoscopic and peripheral vision.
Audio -- Tactile -- Smell(?)



ASKAP dish (Proposed)



Rocks, fossils (iVec)



Cliff face
(Earth and Geographical Sciences, UWA)