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The future for our community maybe goes thataway!

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I think the focus of the requested homework assignment for this NRC CSTB meeting on the future of computer graphics research is backwards. The questions ask about key unsolved problems in computer graphics. It is perhaps of more value for us to examine the question of who are the key drivers for our community from the past and into the future. Examining those drivers may help us reorient our efforts from developing new tech without application to focusing our tech on driving application directions.

So let's start by looking at who were the movers/shakers/drivers in each decade in computer graphics:

1970s –

- Drivers for CG
  - Universities – basic research. Pretty unfettered funding for graphics research until about 1976 when it was declared that all graphics problems were solved. Pretty much a drought after that unless hidden in an application area.
  - CAD – initial efforts.
  - DoD – 2D command and control displays, very expensive 3D visual simulation.
  - Molecular modeling – lots of computational molecular modeling.

1980s –

- Drivers for CG
  - DoD – workstation-based 3D networked visual simulation
  - Universities & research labs – VR, scientific visualization, radiosity, user interfaces, animation, much basic research. We probably look at this decade as the graphics glory years. The 1987 scientific visualization report gave new impetus to graphics funding IF it was connected to a supercomputer center.
  - Workstation companies – SGI, HP, others – trying to get us to real-time 3D at a low-price point. Lots of competition, lots of excitement each year at SIGGRAPH.
  - CAD – steady buildup and usage of workstation-based graphics.
  - Entertainment – animation & special effects companies – lots start & die. Few survive. The survivors are those that do well at story. Lots of stories about entertainment companies buying supercomputers to do their rendering and then go into bankruptcy.

1990s –

- Drivers for CG
  - DoD – Workstation-based networked visual simulation drops the cost of visual simulation by two orders of magnitude. PC-based 3D networked visual simulation later in the decade drops it more.
  - PC card companies make 3D a commodity – nVidia, 3dfx, … workstation companies die. Most university-based graphics hardware programs disappear.
  - CAD moves to Pcs.
  - University research – not the largest driver of progress in computer graphics but some nice work done this decade – networked VR, visualization, non-photorealistic rendering, 3D interfaces. Lots of excellent work out of the gang of five graphics STC.
  - Game industry pushes 3D PC card companies to innovate. More impact than DoD by 1995/1996. The game industry has the largest impact on the future of graphics starting about 1993 with the distribution of the first few levels of Doom onto the Internet in December 1993.
  - Entertainment – animation & special effects companies that do well at developing story survive and prosper. Yeah, Pixar!

2000s –

- Drivers for CG
    - DoD, following the game development community, pushes into the game development space for its visual simulation, training and experimentation requirements.
        - Game engines – open source engines & tools, commercial engines & tools.
        - Artistically rendered scenes from DoD-standard terrain databases.
        - MMOG architectures
        - Game analysis & learning
        - Mobile & wireless devices
        - Console devices
        - Web-based 3D
        - Computer generated autonomy – how do we model human & organizational behavior. Think SimCity morphed into SimDefense.
    - PC graphics card companies consolidate, many disappear. Graphics hardware is a commodity. Hard to get innovation except in the small.
    - Workstation companies die or struggle to redefine themselves – where do we get multi-headed graphics machines if they all die? Whither the future of the CAVE?
    - Entertainment – animation & special effects companies are a steady business that still depends on good story. No motion picture is made anymore without some use of computer graphics. Graphics is a commodity for this group.
    - University research? Hard to see how it can keep up with Entertainment, the Game Dev industry, and DoD, unless universities hook themselves to building application systems for these sponsors and the sponsors perceive that work useful! Will become increasingly harder to justify much in the way of basic research as graphics is seen as a commodity readily purchased.
    - Game industry keeps on trying to make the best-latest real-time, 3D first-person shooter! Consolidation in the game engine industry as game engines & tool sets for game development almost become a commodity. There will be fewer and more expensive choices in the future!
    - Corporate interest in strategic messaging via interactive gaming begins to come alive, thanks to America's Army success. America's Army team forms Propaganda Games to catch all the business.

2010s –

- Drivers for CG
    - Entertainment/Game Dev – tools & engines for 3D interactive games become such a commodity that weekly interactive 3D onlines begin. Kind of like weekly TV but interactive. Reality Onlines are all the rage!
    - PC card companies disappear as 3D becomes purchasable in a single chip or just comes as part of the processor you were buying anyway.
    - DoD – wristwatch 3D visSim, virtual retinal displays, sourceless body tracking. Game training effort so successful that Ender's Game becomes possible.
    - Propaganda Games becomes the Pixar of the videogame industry, signing McDonalds, Ikea, the US Army, and the US Navy for long-term strategic communication onlines.
    - Internet model of clients/servers is seen as mistake as wireless, wearable computers with terabytes of internal storage make everyone their own personal library of congress (PLICs). Augmented cognition technology developed by DARPA back in the 2000s made the elimination of the WIMP interface possible for the PLICs. Now the live-in-mind-processor (LIMP) does it all for you. New meaning to the phrase "cut-the-cord"! Apple markets first version from its former iPod Division, the iBrain!
    - University research? Story engine developed in the research lab! Interactive story now readily developed, sort-of. Still needs the input of creatives, disappointing entertainment execs everywhere. Little interest in the last-mile of photorealistic rendering – graphics is a commodity!
    - Pixar buys the remains of Disney just for the name. Disney finally crushed by brain drain begun under Eisner reign. The final blow for Disney was its failure to enter the first-person-shooter genre of onlines until too late.

- Corporate interest begins in rehab centers for failed early-in-the-century experiments with strategic messaging via online gaming. Too many people claiming Army retirements for their America's Army time.
- Nobel prize awarded to woman who develops an online game-genre that appeals to young girls and women. It is not necessarily a first-person shooter derivative. ;>)

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