Entertainment Industry Research Directions & Inspirations

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Modeling & Simulation: Linking Entertainment & Defense

The Director of Defense Research & Engineering (DDR&E), Dr. Anita Jones, funded a study through the National Research Council Computer Science & Telecommunications Board (NRC CSTB).

- A committee was formed representing the virtual environment, computer graphics, networked videogame, film and entertainment communities.

Goal of the Committee

To explore how the Entertainment Industry (EI) and the Department of Defense (DoD) and its associated industries can develop a stronger technology base for modeling & simulation and profit from a closer working relationship.

The two communities are connected ...

The two communities are connected but we often don't think about it.

Large amounts of government-funded research and infrastructure form the foundation of the EI industry from computing to computer graphics to the Internet...

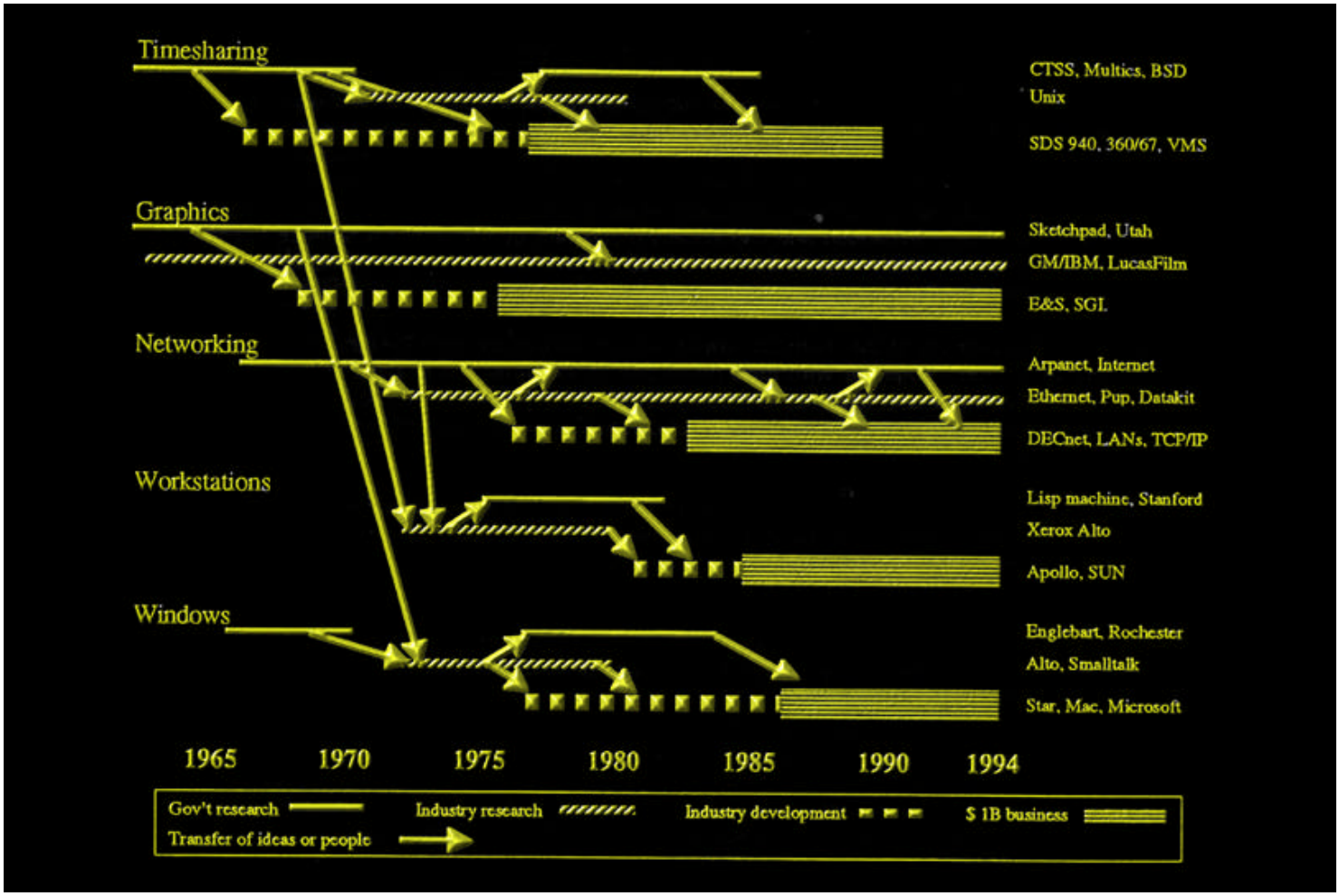
Span of Time ...

DoD Funding

- Computer graphics - Geometry Engine ~1979.
- Internet - ARPANET in late 1960's.
- SIMNET ~1984

EI Use

- Computer graphics - Nintendo-64 1996.
- Internet - Mosaic 1993, Netscape 1994.
- Networked Doom 1995.


Timesharing
CTSS, Multics, BSD Unix
SDS 940, 360/67, VMS
Graphics
Sketchpad, Utah
GM/IBM, LucasFilm
E&S, SGI
Networking
Arpanet, Internet
Ethernet, Pup, Datakit
DECnet, LANs, TCP/IP
Workstations
Lisp machine, Stanford
Xerox Alto
Apollo, SUN
Windows
Englebart, Rochester
Alto, Smalltalk
Star, Mac, Microsoft
1965
1970
1975
1980
1985
1990
1994
Gov't research
Industry research
Industry development
$ 1B business
Transfer of ideas or people

Research Agenda

Technologies for Immersion

Networked Simulation

Standards for Interoperability

Computer Generated Characters

Tools for Creating Simulated Environments

Technologies for Immersion

- *Image generation - real-time, graphics workstations capable of generating complex visual images.*
- *Tracking - technologies for keeping track of human participants in virtual environments.*

Technologies for Immersion

- *Full sensory interfaces - technologies for providing a wide range of sensory stimuli: visual, auditory, olfactory, and haptic.*
- *Locomotion - technologies that allow participants to walk through virtual environments while experiencing hills, bumps, obstructions, etc.*

Networked Simulation

- *Multicast and area of interest managers - to facilitate many-to-many communications while using limited bandwidth.*
- *Higher bandwidth networks - to allow faster communication of greater amounts of information among participants.*

Networked Simulation

- *Latency-reduction - techniques for reducing the true or perceived latency in distributed simulations.*

Standards for Interoperability

- *Virtual reality transfer protocol - to facilitate large scale networking of heterogeneous distributed virtual environments.*
- *Architectures for interoperability - network software architectures to allow scalability of distributed simulations without degrading performance.*

Interoperability - What needs to be done?

A careful, considered, joint research program needs to be put together that actually studies the issues involved (as opposed to slapping code together for rapid demo) in designing a common, scalable network software architecture capable of supporting large numbers of players across wide area networks.

Computer-Generated Characters

- *Adaptability - development of computer generated characters that can modify their behavior automatically.*
- *Learning - development of computer generated characters that can modify their behavior over time.*

Computer-Generated Characters

- *Individual behaviors - computer-generated characters that accurately portray the actions and responses of individual participants in a simulation rather than those of aggregated entities.*

Computer-Generated Characters

- *Human representations - authentic avatars that look, move, and speak like humans.*
- *Spectator roles - ways of allowing observers into a simulation.*

Computer-Generated Characters

- *Aggregation/deaggregation - the capability to aggregate smaller units into larger ones and deaggregate them back into smaller ones without sacrificing the fidelity of a simulation or frustrating attempts at interoperability.*

Tools for Creating Simulated Environments

- *Database generation and manipulation - tools for managing and storing information in large databases, to allow rapid retrieval of information, feature extraction, creation, and simplification.*

Tools for Creating Simulated Environments

- *Compositing - hardware and software packages that allow designers to form composite images with images taken from different sources (whether live-action footage or 3D models) and facilitate the addition or modification of lighting and environmental effects.*

Tools for Creating Simulated Environments

- ***Interactive tools - tools that use a variety of input devices (more than a mouse and keyboard) to construct models and simulations.***
  - When you are building 3D VEs, you need to place things with hands, not nudge things with a mouse and keyboard.

Carrying Out the Collaboration

We have a shortage of talented, high-quality, experienced people to develop virtual environments, modeling and simulation software, digital animation, design, and scripting of virtual worlds.

Cross-disciplinary skill-sets

And the people sought are not just engineers and computer scientists.

They are programmers and content developers with cross-disciplinary skills.

- Such skills enhance the quality of virtual world development and the implementation of such cutting-edge technologies.

Interdisciplinary Infrastructures

We need interdisciplinary university infrastructures, with degrees we have never seen before.

- We need people graduating with BS, MS and PhD degrees in subjects like modeling, virtual environments and simulation, electronic storytelling, ...

Where to get the report ...

Modeling & Simulation: Linking Entertainment & Defense

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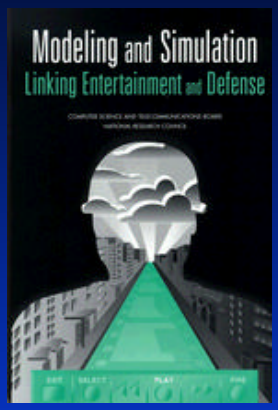

Web site

Online NRC report

http://www.nap.edu/readingroom/books/modeling