Interactive Simulation

Class 1
Prof. Roger Smith

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Introductions

- Majors
  - Industrial Engineering
  - Modeling & Simulation
  - Education
  - Computer Science
  - (others ...)

- FEEDS
  - Videotapes
  - RealMedia on Web (www.feeds. engr. ucf. edu)
Roger D. Smith

- Vice President & Group CTO, Titan Corp.
- President, Simulation First LLC.
- Adjunct Professor, University of Central Florida
- Adjunct Professor, Florida Institute of Technology
- Industrial Advisory Board, University of Florida, Computer Science Department
- Editorial Board, ACM Transactions on Modeling and Computer Simulation
- Consultant/Instructor, Distributed Simulation Technology
- Lecturer, Georgia Tech, Univ Virginia, Univ Texas, UCF
- Chairman, ACM Special Interest Group for Simulation
- General Chair, Electronic Conferences on Training Simulation
- STRICOM, STAR Award
- SCS, Outstanding Contribution Award
- ACM, Service Award for Simulation
- General Dynamics, General Manager’s Commendation

Class Documents

- Watch the web site:
  - http://www.simulationfirst.com/ein5255/
- Syllabus
- Research Instructions
- Lecture Schedule & Slides
- Resources & Software
- Assignment Samples
  - Creator, Research Papers
Textbooks

- ISBN 1-85233-012-0
- ISBN 0-201-32557-8

Assignments

- Creator Project
- Research Paper
- SimStorm World
- Mid-term Exam
- Final Exam
MultiGen Creator

www.multigen.com

AIS SimStorm

www.ais-sim.com
Definitions

- Interactive Simulation, what is it?
- Simulation is a representation of a real-world or hypothetical events and processes
  - Live: Real entities included in the simulation (QZAR ...)
  - Constructive: All entities are computer generated
  - Virtual: Real and computer generated entities are present and interact with environment (games ...)

Definitions

- Interactivity is the ability of the user to change the outcome of an event or a process
- Interactive Simulation is a representation of an event, which outcome is changeable by the user.
Benefit

- The benefit of Simulation is reproducing events and processes that would have been expensive, time consuming, or simply infeasible otherwise.
- In our case, we are using simulation for training purposes.
- The focus of the class is:
  - Interactive Virtual Simulation Technologies for Training Purposes

Benefit for Training

- It is better to make mistakes in the simulator, than in real life. In combat situation, the simulator is more forgiving.
- It cost less and take less resources to set up a training exercise that include multiple entities.
Virtual Reality (VR)

- Like video, VR is another media
- It conveys information to the user in different ways than any other media, by adding interactivity

Virtual Reality (VR)

- VR Systems are characterized by a 3D computer generated environment that a human interact with as a player
- VR is about using computers to create images of 3D scenes with which one can navigate and interact
- VR is the use of computer technology to create the effect of an interactive three-dimensional world in which the objects have a sense of spatial presence
VR and Training

- Evolution of computer based education and training:
  - Text (Books)
  - Pictures (Books with pictures)
  - Video and Sound (limited interactivity)
  - VR and 3D graphics (interactivity similar to real life)
- VR became the future of interactive simulation and training.

VR and Training

- The effectiveness of training is achieved by immersing the trainee in a Virtual Environment.
  - Immersion means isolating the trainee from any event that is not relevant to training session such as background noises.
  - Immersion contributes to positive transfer of skills learned in the virtual world to the real world (combat flight simulators)
Virtual Environment (VE)

- In the same way live simulation involves real people moving in real terrain and building, virtual simulation involves real and computer generated people that interact with virtual terrain, buildings...
- A VE is a set of virtual terrain, buildings, entities, and environmental features and properties (weather, time of day ...)
- Also called synthetic environment

Real Time Simulation

- A simulator is said to be Real Time, when the user’s actions are processed and displayed without time delay. Not realistic
- There will always be some processing time to the user’s actions. Therefore, the definition of an acceptable Real Time System:
  - A simulator is said to be Real Time, when its processing time is fast enough to make the user believe that consequences of his actions are immediate.
Virtual Environments you have been in …

Simulation ~ Games
Military Simulation

Military Games
Important Games

- Wolfenstein 3D
- Ultima Online

Adaptive Learning

- Galapagos
  - Learn the Hard Way
- Dogz, Catz
  - Collect Rules of Behavior
- Creatures
Intelligent Agents

- **The Sims**
  - Work Environment - Create your coworkers and abuse them

- **Traffic Sim**
  - Model route to work and experiment with it at different commute times/congestion
  - Specific cities modeled

- **Negotiation**
  - Roof Jumper
  - Bank Robber
  - Nuclear War
  - Terrorist

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Is Real-time Distributed Simulation a Weapon?

*Keynote Presentation: 2000 Distributed Simulation for Real-time Applications Conference, San Francisco*
Interactive Simulation

Interactive Simulation can do more . . .

- Wargames - Training in alternatives to killing
- Medicine - Chemical interactions
- Poverty - Distributed Jobs
- Hunger - Transport Food, Reduce Waste, Predict Weather
- Commerce - Accelerate Velocity of Money
- Education - Teach Everyone (Pub/Sub in Chat)
- Economy - Sustain Growth, Avoid Collapse
- Communications - Share Info, Predict Needs (Hurricane)
- Environment - Weather, Earthquakes, Hurricanes
- Public Safety - Traffic, Disease
- Entertainment - Beyond shooting games

Military Applications

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Distributed Engineering

Air Traffic Control
Weather Prediction

Internet Traffic Planning
Stock Market

Interaction
Real-time

Movie Production Pipelining

Trying to protect Eema, a slow-moving styracosaurus, from the water in Alaska. Eema, voiced by Della Reese, is one of the engine created by the effects team.

For this scene, the effects crew shot a physical model breaking the slate, then replaced it with Raymand's CG bust, and added someCG water and Fox the tensor.
Distributed Theme Parks

Multiplayer Network Gaming
Distributed Real-time Holodeck