Recent Advances in Virtual Worlds for Science and Technology Research and Development

Walt Scacchi
Center for Computer Games and Virtual Worlds
Donald Bren School of Information and Computer Sciences
University of California, Irvine

http://cgvw.ics.uci.edu
Overview

- Recent virtual world projects for Science or Technology R&D
- Future opportunities for virtual worlds for science and technology R&D
Creating game-based learning environments with virtual worlds
- “Play” and experiential behavior are surprisingly effective way to audition, rehearse, act, fail, and learn
- Mixed reality worlds can link virtual and physical activities
- Virtual worlds are best at providing new experiences
  - Virtual work practices
  - Not the same as existing work practices
  - Need to learn what to do, how to do it, and more
    - Not obvious how to be faster, better, and cheaper using virtual worlds!
Collaborative meeting work in virtual world
Collaborative work in physical world
Radically colocated work in physical world
Recent Virtual World Projects for Science and Technology R&D

• Collaborative science meetings and immersive simulations
  – Meta Institute for Computational Astrophysics

• Collaborative science learning and data exploration environment with spherical displays at Discovery Science Center and in OpenSim
  – Science on a Sphere

• Collaborative game world for semiconductor fabrication or nanotechnology design
  – FabLab training simulator

• Game-based virtual worlds for advanced health care
  – Robotic therapeutics and tele-rehabilitation

• Envisioning future virtual worlds for possible cultural experiences and new technological innovation opportunities
  – Virtual Life 2010+
  – Immersive motorsports racing experiences
    • Low-cost to high-cost virtual world simulators
  – OutRun @ UCI
Spherical displays and “spherecasting” support:
NOAA Science on a Sphere installation in Opensim
Game-based virtual world for semiconductor/nanotech fabrication training, remote presence and diagnosis

FabLab Demo Reel
Semiconductor/nanotechnology fabrication training game
Virtual worlds for health care and tele-rehabilitation

- Virtual worlds can be used to support various kinds of tele-medicine and tele-robotics applications/tasks

  - “Rehabilitation” tasks supported can include:
    - Remote observation, tele-consultation, role-playing and identity switching through avatars, device data collection, device software updates, collaborative product/prototype development, and more
Assisted performance training and robotic rehabilitation

- *Wii Sports* (best selling game for Nintendo in 2007; 45M copies sold worldwide through 2009)
  - Boxing
  - Bowling
  - Golf
  - Tennis
  - Baseball

What's next?
VW haptic interfaces with therapeutic applications

- Simulated devices
  - *Guitar Hero* guitar; *Rock Band* drum set
- Haptic wheels, trackballs, and joysticks
- Force-feedback play controllers (racing game wheels, pneumatic bladders)
- Multi-sensor play controllers (including video capture, infra-red, accelerometers, neurological sensors, electro-goniometers (SEMG), etc.)
  - *Wii Remote* and nunchuk
- Multi-jointed, body-worn sensors as play controllers
  - Data gloves
  - GypsyMIDI
Haptic interfaces with possible therapeutic applications

• Endoscopic surgery training “joysticks”
  – Simball 4D joystick adapted to therapeutic game play for stroke rehabilitation
  – http://www.g-coder.com/content/view/7/6/

• 3D, real-time video motion capture enabling *mixed reality game play* spanning physical and virtual worlds
  – *Project Natal* at Microsoft
  – In-game characters can interact with human players through gestures and body movements
  – http://www.youtube.com/watch?v=g_txF7iETX0
The design and utility of a game to realize therapeutic value is not obvious.

Virtual Life Demo Reel
Game-Based Virtual World Simulator Interfaces
for immersive motorsports racing experiences
Game-based virtual world simulator you can actually drive in physical world! -- OutRun @ UCI
Future opportunities for games and virtual worlds

• Key challenges to address/overcome -- scale and scope of:
  – Immersion
  – Verisimilitude
    – Within worlds
    – Spanning physical-virtual worlds
  – Co-participation and Collaborative work
  – Relocatability (telepresence)
  – Decentralized virtual organization

• New research center for Computer Games and Virtual Worlds at UCI
  – http://cgvw.ics.uci.edu
  – Funding from National Science Foundation #0808783, Digital Industry Promotion Agency (Daegu, South Korea), and others.
  – Want to come and play with us?