Serious Games:

Games for Learning & Changing the World

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Serious Games

- My background
- What are Serious Games?
- How are they different?
- How they get produced
- Types of Serious Games
- Trends and Challenges
- Games to Change the Future

My Background

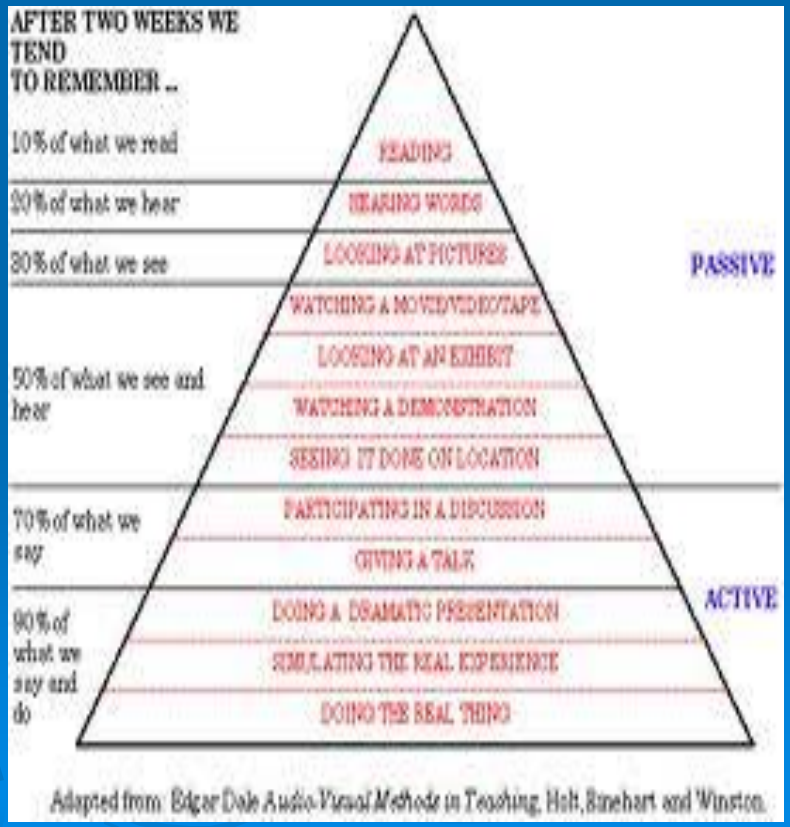
- War games at the RAND Corp.
- Doctorate in Educational Technology: dissertation on producing Serious Games
- Member of production team for first MMOG (Massively Multiplayer Online Game, SIMNET, cost $240 million)
- Produced games & networked simulators (DARPA, military and intelligence communities)
- Development of Brilliant Munitions & Special Weapons
- Co-produced online entertainment games (*Fifth Element, Titanic, Xena: Warrior Princess, Lost in Space*, etc.)
- My license plate:

What are Serious Games (SGs)?

- Serious Games: Games used for other than just entertainment
- Typical Applications
  - Education (e.g., science, math, music)
  - Training (e.g., military, medical surgery, driving)
  - Decision Aiding (e.g., marketing, crisis response)
  - Health (e.g., exercise, meditation, yoga)
- Remember: Serious Purpose, BUT must still be fun

Why Serious Games?

- They map to how brain really works
  - Esp. well suited for "21st Century Learner"
- Immersive, promote retention & transfer
- Customize learning for users
- Vary speed, difficulty, sequence
  - Not "one size fits all" lectures
- Motivate with Gamification
  - Challenges & rewards
  - Mastery & peer interaction
  - Immersive multisensory input
- Continual assessment



Who uses Serious Games?

- Government
  - Military and Intelligence Community (IC)
  - First Responders (police, firefighters, DHS)
- Schools (K12, Universities, Trade Schools)
- Humanitarian Aid, Disaster Relief
  - UN, Red Cross, World Bank, NGOs, DHS
- Medical
  - Medical Skills Training (Doctors, Nurses, Pharma)
  - Team training (Operating Room team)
- Lawyers
  - Training and Exercises (courtroom trials)
- Fitness
  - Meditation, sports training, exercises
- Industrial (Fortune 1000 Companies)
  - Hotels, Restaurants, food service, service support
- Specialty Areas
  - Politics, Religion, Community Planning, Group Organizers
- SOON: Almost every organization will use them!

How do Serious Games get made?

- Identify a customer group with a specific need
  - E.g., firefighters need hazardous materials training
- Get funding or a sponsor
  - Typical: $500K-$2 million
- Form a production team
  - Artists, animators, programmers, marketing, etc.
- Turn the user need into a game
  - Work closely with intermediary experts in the group
- Prototype early, user feedback
- Keep evolving until it's right
- Go gold (production version)
- Follow-on updates

How are Serious Games different?

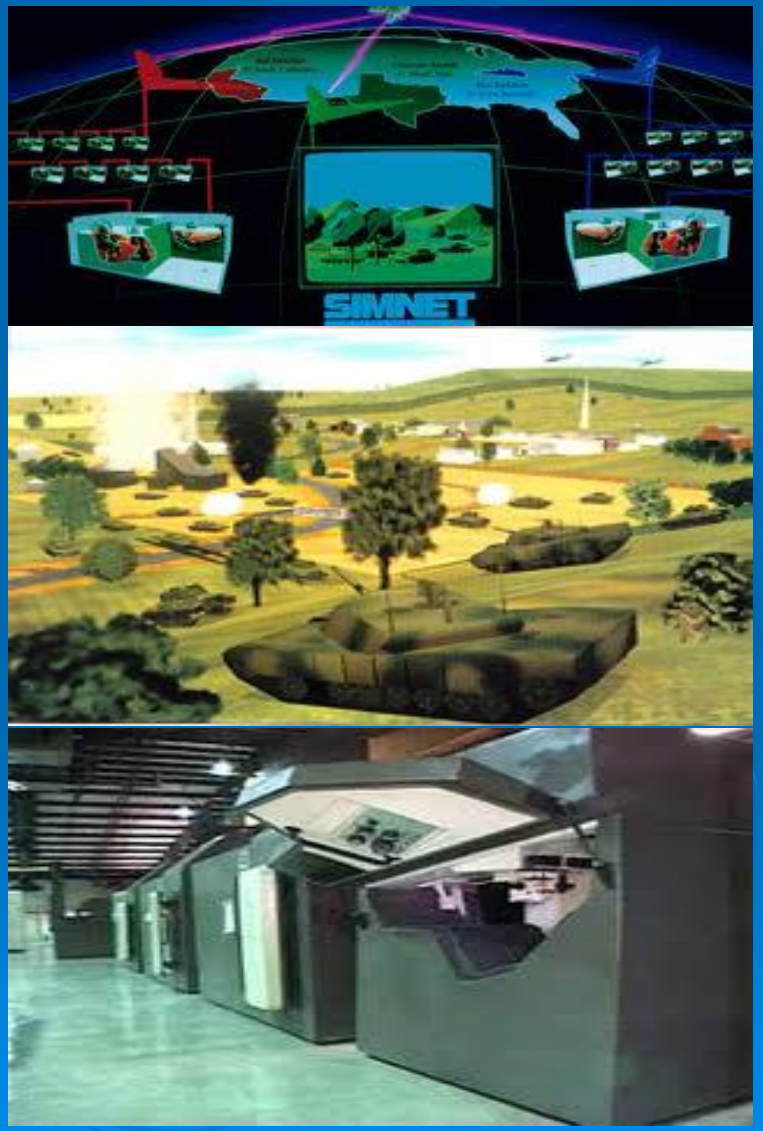
- They must answer a problem
  - How do we train a pilot to fly in a storm?
  - Training in a real airplane in real storms is too dangerous
- They must be authentic
  - E.g., aircraft controls must look and feel real
  - DIFFERENT from entertainment game such as *World of Warcraft*, where realism is unimportant
- The customers must be able to use the game
  - E.g., all 747 pilots can train with it, not just a younger age group
- Harder to define final design
  - End users typically not game experts, do not know what they need (may think they know what they want)

Summary of Differences

	Entertainment	Serious
Purpose	Entertainment	Answer a problem
Authenticity	Unimportant	Critical
Design Flow	In-house	Interactive between game team and users
Test and Change	At end of game	Early on & ongoing
Payment	Back end	Front end
Gameplay & Market	Very wide	Focused
Gamification & Fun	Yes!	Yes!

History: Online Serious Games

- SIMNET (SIMulation NETwork)
  - Produced for DARPA
  - Cost $240 million
- First MMOG
  - Hundreds, then thousands of crewed and SAFOR simulators and player stations
- Pioneered Technology
  - Low cost GPUs, distributed processing, RTI, “dead reckoning,” etc.
- Pioneered SG Processes
  - “Back to the Future” capture & replay
  - Used for team & group training, systems prototyping



Examples of Serious Games

- Military Training
- Language Learning
- First Responders (Crisis Response)
- Homeland Defense
- Medical
- Social Change
- Education (K12 & University)
- Legal
- Political
- Religion
- Industrial
- Business
- Health and Fitness
- Persistent Worlds: Game-Like Environments

Examples of Military SGs: America's Army

- *Online, also PS & Xbox*
- **www.americasarmy.com**
- **12 Million Players**
- **$8MM Initial, $10MM/Yr.**
- **Initially a PR Game**
- **Now PR and Training**
- **Most Successful SG**
- **Civilian Version (free)**
- **Military Version**
  - **Up to SECRET Level**
  - **Training of Army Units**
  - **Used to evaluate new weapons and concepts**

America's Army (cont'd)

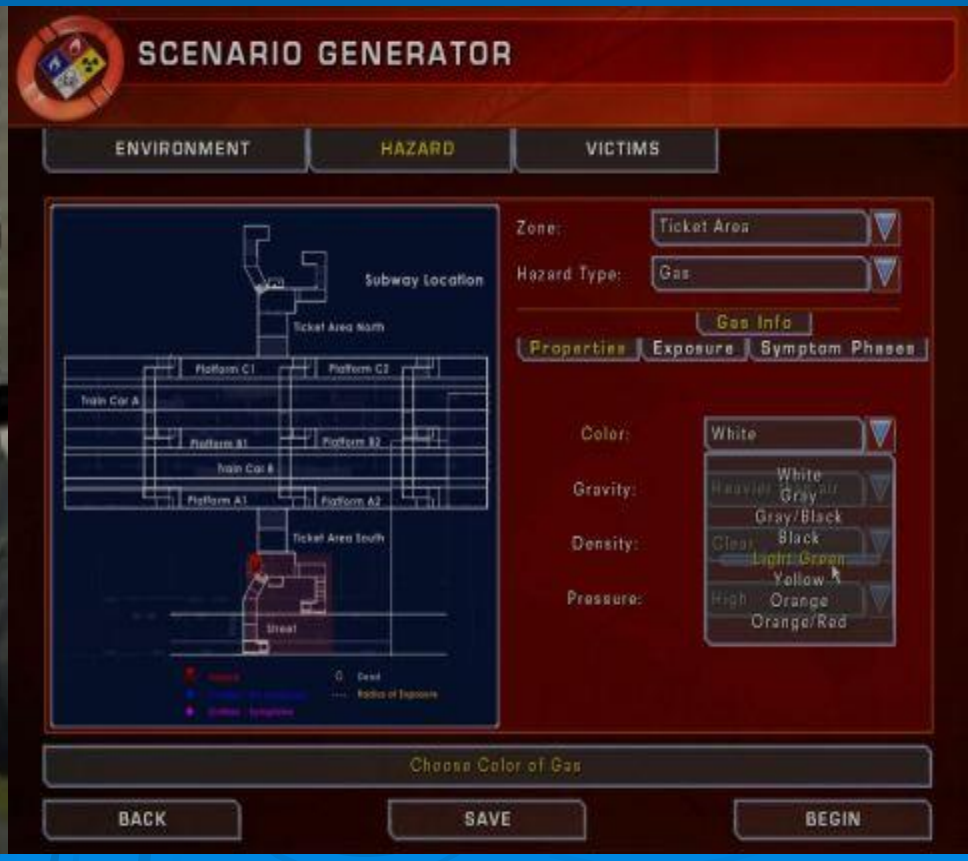
- Funded by US Army (Manpower)
- Created at Naval Postgraduate School in Monterey, CA
- Employs *Unreal Tournament* Engine
- Used Rapid Prototyping Approach with real soldier feedback
- Upgrades keep the learning fun and challenging

Language Games: *Tactical Iraqui*

- Language & Culture Learning Game by *Alelo, Inc.*
- Funded by DARPA ($8M)

Public Safety Games: *Hazmat HotZone*

- Developed by *Carnegie Mellon,* now *Sim Ops Studios*
- Teaches Firefighters Operations in Hazardous Areas (Gas, Radiation, etc.)
- Instructors create scenarios, levels of difficulty, etc.



First Responder Training

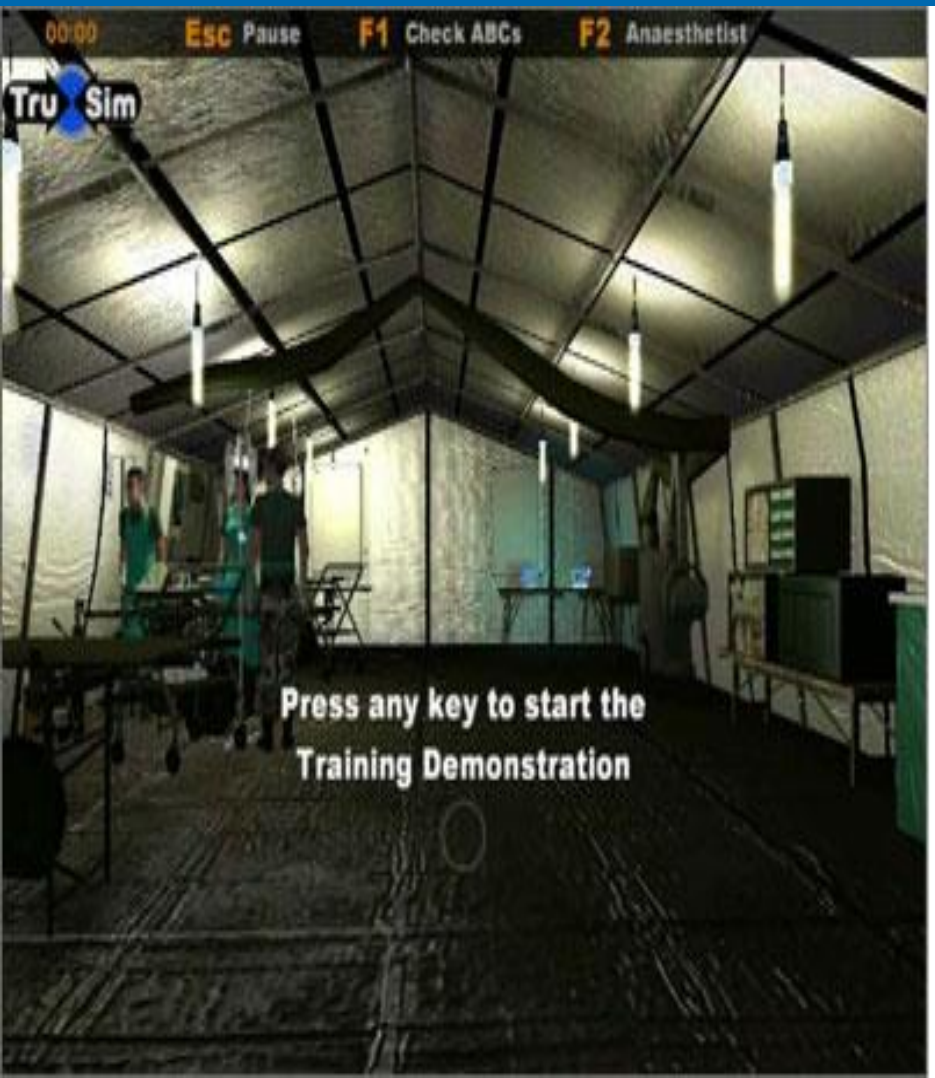
Public Safety Games: *Code3D*

- Firefighter Training
- “Userware” lets users modify game
- Community creates game scenarios to share lessons learned—by experience, not books!

Homeland Security: Airport Security Training

Medical Games

- *TruSim* by Blitz, *Pulse* by BreakAway Games
- Train Surgical Teams for ERs & ORs



Medical Games (cont'd)

- Treatment of PTSD
  - Very high number (300,000) of patients with severe combat related Post Traumatic Stress Disorder
  - *Virtual Iraq,* by Dr. Skip Rizzo (USC, San Diego Naval Hospital)
  - Dramatic and successful cures via game-based exposure therapy

- Treatment of children with cancer
  - *Free Dive*, by *BreakAway Games*, for distraction during chemotherapy and other medical treatments

Games for Social Change

- *Food Force*, by Deepend and Playerthree (www.food-force.com)
- For United Nations, about fighting hunger

Social Change: *Pamoja Mtaani*

- Game for Kenya (HIV Rate: 5%)
- *Pamoja Mtaani* (“Together in the Hood,” Swahili)
- Virtual Heroes, Inc., Warner Bros.
- Adopt one of 5 Identities, learn to beat HIV threats

Social Change Games

- PeaceMaker
  - Turn-based strategy
  - Role of Gov't head
  - By ImpactGames

- Darfur is Dying
  - News Game
  - Flash-based browser
  - By Action Games

K-12 and University Games

- *Wolfquest*, for Biology Classes and Zoos
  - By *EduWeb*
- *PowerPolitics III*, for History Classes
  - By *Kellogg Creek Software* (*www.kelloggcreek.com*)

Legal Games

- *Objection!* and *Civil Objection!*
- *Slipfall!* and *Expert Witness!*
- By Transmedia Games (www.objection.com)
- For attorneys to practice court cases
- In wide usage; can get academic credits
- Other Legal Apps: Forensic Animations for presentations to Juries in Court

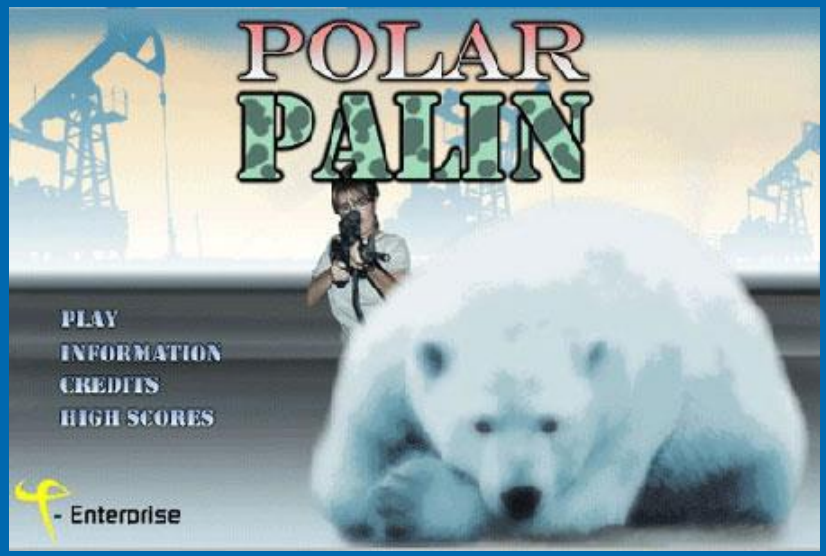
Political Games

- *Take Back Illinois*, for Republican Party
- By *Persuasive Games* (www.takebackillinoisgame.com)

- *Political Machine 2012*
- RPG for Presidential Elections
- State by State Campaigns
- By Stardock

Political Games

- *Polar Palin*
  - By *Enterprise*



- *Oiligarchy*
  - Game about global warming
  - Free online
  - By Addictive Games

Religious Games

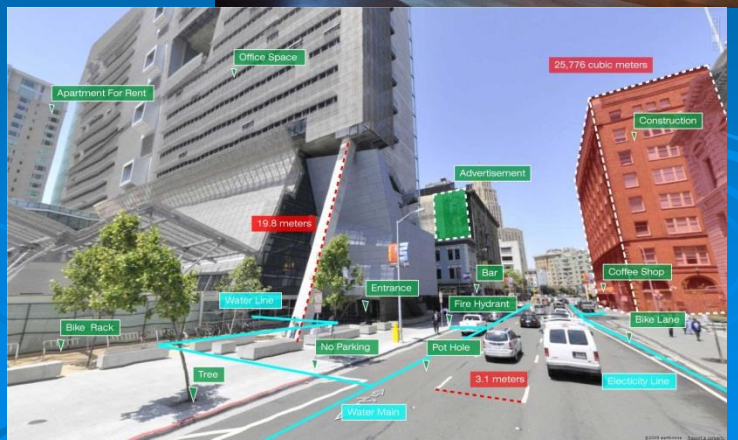
- *Interactive Bible* series
- Teaches Bible stories interactively
- By *GraceWorks Interactive*
- Sales in Christian Stores, via Internet

- C*atechumen*, by N'Lightning
- Christian Adventure Game
- Also produced *Ominous Horizons*

Augmented Reality

AR: CGI overlays onto Real World

- Just in Time (JIT) Training (e.g., see how to remove car parts)
- Museums—bring displays to life, support interaction
- Tourism—overlaid info on local attractions



Augmented Reality (cont'd)

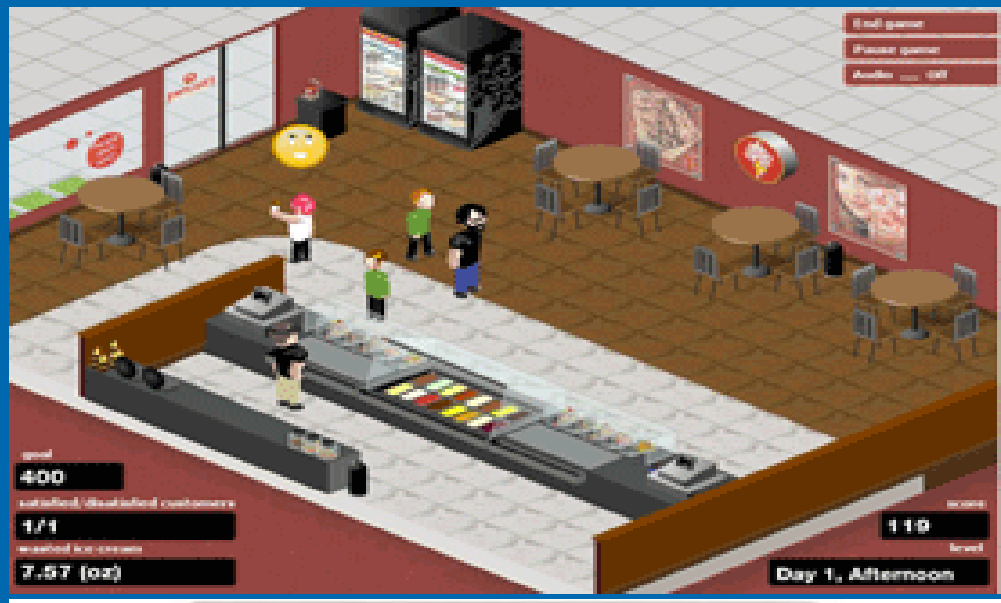
- GCI (Gesture Control Interface)
- Location Based Gaming (CGI overlays visible with mobile devices)
- Architecture and Design—visualize new structures & flows in context of real world

AR for Training

Industrial Training Games

- *Stone City*, for in-house staff training of Stone Cold Creamery
- By Persuasive Games (www.persuasivegames.com)
- Teaches interaction with customers and how to serve product

- McDonald's *eSmart* Game to train new employees
- Used in 3,700 stores in Japan
- Developed with Nintendo on DS platform
- Cost approx. $2.2 million
- Is expected to cut training time in half



Business Games

- Range from entry level to executive decision making

Health and Fitness Games

- Konami's *Dance Dance Revolution* was pioneer
- Nintendo Wii introduced range of interactive devices with movement sensors
- iPod & iPad take movement monitoring outdoors
- Includes meditation, yoga, dance, martial arts, aerobics, sports training
- Xbox Kinect optically tracks multiple user movements
- New: BSNs (Body Sensor Nets) for SG input/output

Growth Area: mHealth

- High investment area for VCs (e.g., $100M from Qualcomm)
- Problem: high health costs, funding penalties, growing obesity, diabetes & allergic problems
- Empowers and motivates patients to manage health with handhelds
- Post treatment: track dosages
- Fitness: Exergames with sensors
- Nutrition: motivate healthy eating, suggest alternatives, reward behavior

Growth Area: Gamification

- Animated interfaces to apps
- Location Based Services with gamification
- Customer Relations Management
- “Mini Games” for Organizational Training
- Animated News Programs with AR
- Gamified HCI for Consumer Electronics

Growth Area: Cyberwar

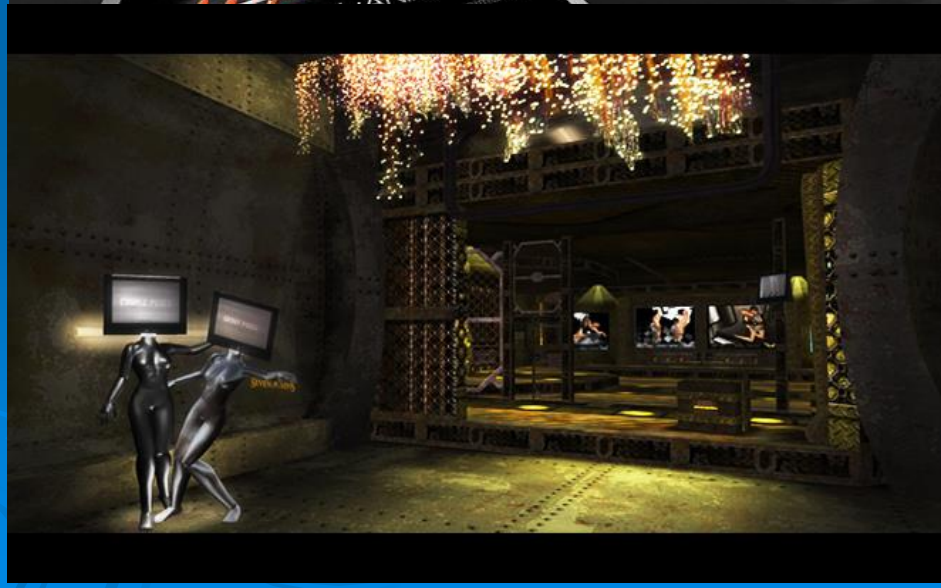
- Cyberwarrior training is critical global need
- Many jobs (military, banks, corporations, oil & gas, etc.)
- Interactive GBL is effective
- War Game interactions
- Advanced 3D visualization
- Collaborative Communities of Practice
-

Persistent Worlds

- Online 3D worlds continue 24/7
- Not true games, but game-like environments for teaching, business meetings, research, virtual classrooms
- *Second Life,* by Linden Labs (www.secondlife.com)

Persistent Worlds : Selling Movements

- Specialized movements for avatars in Second Life & other Virtual Worlds
- Dance moves and “posing” especially popular
- Created by specialty studios, often with motion capture
- Providers include MyAnimation and Lost Angel Industries (pictured), Loop, Moonlight, and Purple Poses.



Custom Mocap

Persistent Worlds: *Second Life*

- Many business & job opportunities
  - Create & Sell Virtual 3D Objects
  - Clothing/Fashion, jewelry
  - Build and furnish houses, apartments
  - Avatar Customization

Second Life (cont'd)

- Design Architecture/Buildings
- Create in-world games
- Meetings and Events
  - IBM, other Fortune 1000 hold global meetings here
  - Weddings & Parties

Second Life (cont'd)

- Set up stores (Some do $100K+/yr)
- Commercial Promotions
- Classrooms
- Concerts, Book Signings
- Home or Mobile Access

Second Life (cont'd)

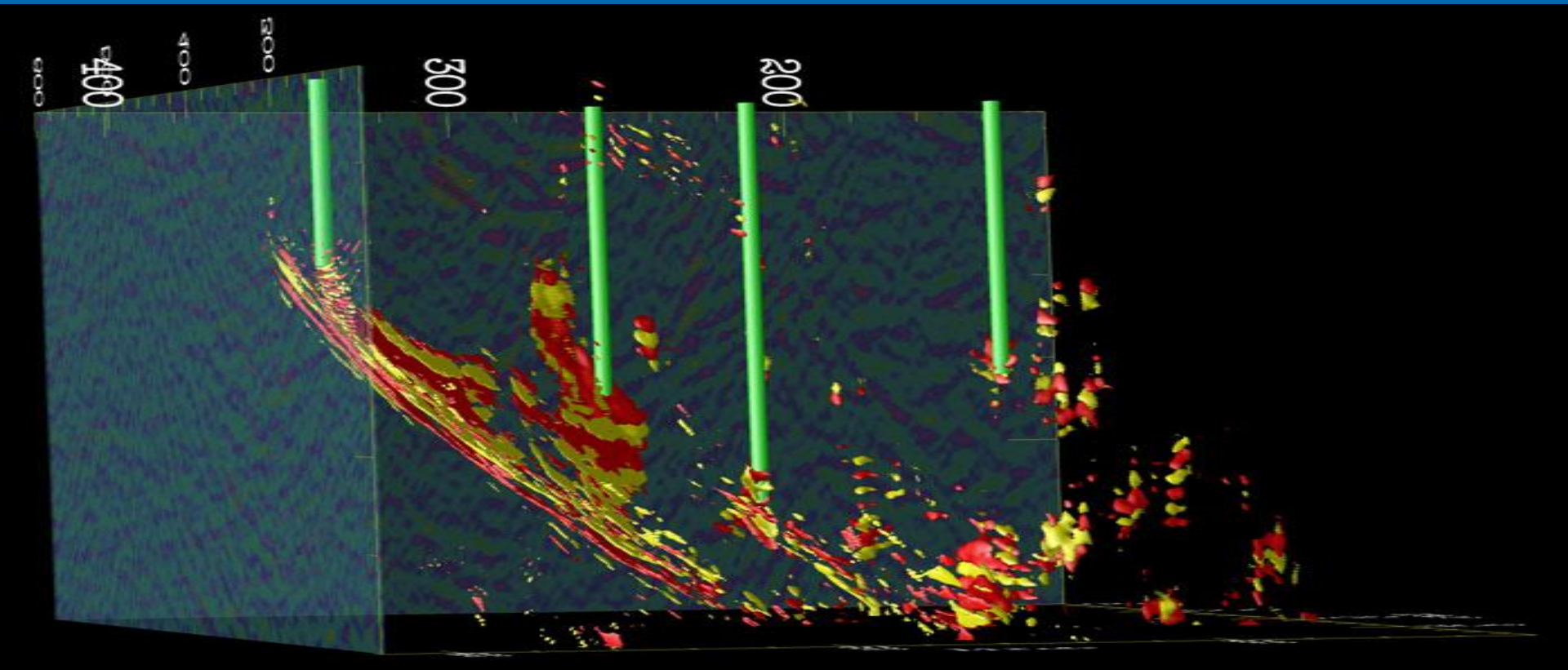
- Virtual Travel (40 countries)
- Presentations & Town Hall Meetings
- Machinima Movies (capture in-world sequence, edit to produce video movie or TV show)

Location Rentals & Services

Events in Virtual Worlds

Science Games: Advanced Visualization

- Used for Oil Exploration, NASA, Medical Science (exploration of human body), etc.
- Simulations and mini-games for easier visualization of complex data



Marketing: Game-like Presentations

- Illustrations, Concepts, Ideas and Advergames

Marketing Presentations, Web-based Promotions, Conference Booth Demos

Future Games and Trends

A Serious Game to learn Serious Gaming

- The Problem: K-16 & other instructors are resistant to SGs
  - SGs are used infrequently in schools and universities
- The Solution: A Learning Game & Environment for SGs
  - Online environment to learn about and get comfortable with gaming
  - Use shaped learning (“baby steps”)
  - Users can learn and change identity (a sign of fundamental learning)

LBGs (Location Based Games)

- Incorporate location of player into game
- Easy to monetize
- Great for tourist locations, cities, museums

Mobile Learning and LBS

Includes short (chunked) learning

JIT (Just in Time) Training—delivered when needed

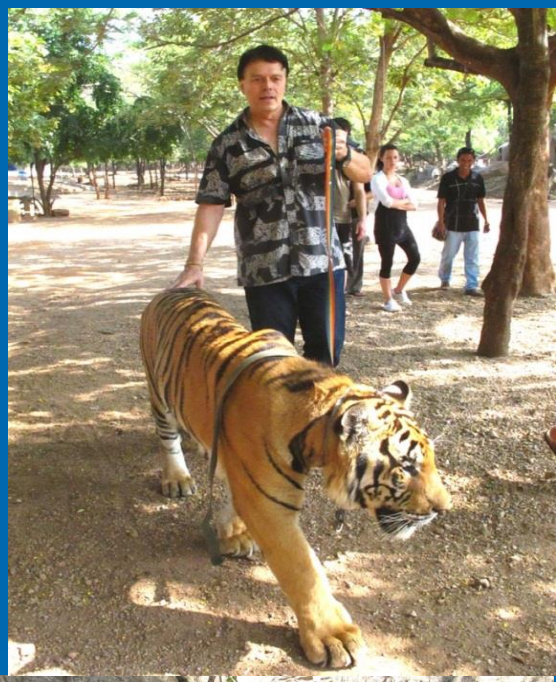
Game-like interfaces

- Example: Collaboration between diverse communities in urgent conditions (e.g., DHS, first responders, disaster response)

10 Lessons Learned in SG Production

1. Don’t forget the audio!

- Tiger growls and other FX increase excitement and tension (pix show author on search for tones)
- Use surround sound for immersion
- Experience shows $1 of audio equals $10 spent on anything else
- “Real” sound may not be good enough—perceived sound (e.g., gunshots) may be louder/different
- Use headphones or decent speakers



Lessons learned (cont'd)

2. Never ask what the user "wants"

- The question is "What does the user NEED?"
- Identify what needs to be authentic
- Determine what can be ignored
- Always look for where you can compromise

Lessons learned (cont'd)

3. Rapid Prototype Development (RPD)

- Unlike WOW, cannot predict final product
- Need to "feel your way" to user acceptance
- Prototype early and often
- RPD drives many programmers crazy (scrum is not for everyone)
- Feedback on early prototypes may need "user representative," not typical users (to understand gaps/omissions in the gameplay)

Lessons learned (cont'd)

4. Team should be close

- Recruit for compatibility
- People need to "play nice" together ("do lunch")
- Dispersed SG production not recommended
- Everyone is involved in the design!
- Rapid reaction and turnaround involves entire team

Lessons learned (cont'd)

5. Budget for "getting to know you"

- Need to spend (a lot of) time with user community
- Travel is expensive
- Users may act like "Communities of Practice"
  - These tend to be tribal, don't trust outsiders
  - Much knowledge is intrinsic, not extrinsic
  - Described in research literature by Wenger and Lave
- Find an Intermediary ("agent" or "boundary spanner")
  - Someone with foot in both camps—understands games and user needs
  - Helps establish fast trust and understanding
- Watch out for community leaders
- Use Video for data gathering and user testing (with tagging)
  - Use for later review and for new team members

Lessons learned (cont'd)

6. Plan for Online User Community

- Updates for technology and procedural changes
- Gain monthly revenue and future upsales
- Capture lessons learned
- Disseminate best practices
- Identify graphic and interactive ways to share lessons learned
- Use online communities to reduce costs

Lessons learned (cont'd)

7. Business Cards for SG students/pros

- Always have them (Bump is not enough)
- Always have them on you
- May need more than one type
  - "Business" versus "technical"
- Use camera or smartphone to capture context of the many people you will meet (people's faces, backgrounds)
- Get one for the POC and POC's assistant

Lessons learned (cont'd)

8. Don't use the word "game"

- "Game" has negative connotations to some user groups (esp. government, military, foreign)
- Use "Serious Game," "SG," "Edugame" or "Simulation"
- Expect FUD (Fear, Uncertainty, Doubt) about gaming technology
  - Some of the worst FUD will come from teachers and instructors (!)
- Don't mention "edutainment"

Lessons learned (cont'd)

9. Don't let user get lost in the game

- HCI should support baby steps, different levels
- Don't let users (esp. seniors or newbie users) get frustrated
- Consider Intelligent Assistant to act as guide and Suggestion Engine
- "Dying" is OK, but clear "failure" (esp. for leaders, in front of subordinates) is not

Lessons learned (cont'd)

10. Avoid Negative Training

- Not important in WOW-type entertainment ("just for fun")
- Could get someone killed or injured in training game
  - Examples: "Ramboing" (moving without team) and "straight path" (middle of the road) approaches in combat zone
- Use "Intermediary Agent" to draw out Intrinsic Knowledge about what to avoid

Summary

- SGs are a growing videogame segment: >$3 billion
- Major potential to improve human learning & interaction
- SG producers can have fun AND make a difference (even save lives)
- Wide range of SGs—may eventually touch every facet of human life
- Future games can use new types of inputs (BSNs, mobile devices with GPS and movement sensors)
- Several new types of games can raise the bar
  - Online game for instructors & others to learn to love SG production

Summary

Serious Games offer:

- A better (more motivating, faster) way to learn
  - Caveat: Not feasible for every application
- New types of learning (mobile, JIT, AR, LBG, LBS, holistic inputs)
- Save lives, help people, make a difference
- Many thousands of new jobs, incl. entry level
- Ways to involve multiple non-traditional game disciplines (medicine, business, mining, architecture, geology, travel/tourism, law enforcement, et al.)

Summary (cont'd)

Serious Games Need:

- New technology to reduce R&D costs and time
  - Intelligent Assistants and AI
  - Frontware for easier interface to multiple applications
  - Userware to easily enable instructors to customize content
  - Robust wireless broadband & security for IA, high resolution
- Leadership
  - National-level coordination and promotion
- Game to Teach the Teachers
  - "SG of SGs" to teach instructors underlying principles, strategies, use, and modification of games
- New Procedures
  - Methods to play MMOGs on mobile devices
  - Monetizing and profitability

Summary (cont'd)

Serious Games Also Need:

- PEOPLE that Can Understand:
  - customer needs and culture
  - art, modeling, animation
  - community building
  - leadership, team work and management
  - Audio and music
  - Computer technology and communications
  - Education, pedagogy, cognitive psychology
  - Gamification and keeping it all fun and challenging
  - Subject Matter Experts in every type of business, product, science and service for global markets

Serious Games Need:
YOU!

Thank You for Your Attention

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