R&D Activities at the UCI Center for Computer Games and Virtual Worlds

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Overview

• Background – recent efforts in CGVWs
• Game development concepts
• A Mission Management Game
  • Mission management related games
    – Eve Online (2007)
    – Texas Hold'Em (traditional)
• Game development issues and opportunities
Computer Games and Virtual Worlds (CGVWs)

- CGVWs are a new media and cultural form
- CGVWs are an immersive, experiential literary form -- CGVW play as emergent narrative and recyclable experience
- CGVWs are a rapidly growing global industry
  - But CGVWs not limited to entertainment
  - Game industry not interested in non-entertainment or serious applications
- "Modding" and making CGVWs is becoming a practice-based learning, skill acquisition, and career development strategy
- CGVW culture as a social movement
  - Your next generation project staff will be fluent in CGVW culture and technology
  - If you're not, they won't come to play/work with you
Recent CGVW Projects at UCI

- Collaborative science learning game (SLG) environment at Discovery Science Center (DSC)
  - *DinoQuest* and *DinoQuest Online* (DQO)
- Collaborative game world for semiconductor or nanotechnology fabrication
  - FabLab training simulator for Intel
  - Nanotech design environment for K-12* (concept)
- Collaborative virtual world for envisioning possible cultural and technological opportunities
  - Intel Research (w/ Linden Labs)
- Science on a (virtual) sphere and spherical info visualization
  - Networked CGVW research and education project*
- Pathway to network of science/technology learning centers
Mixed reality games for informal science education for K-6 students and families

http://www.DiscoveryCube.org/
Web-based science learning games for informal science education for K-6 students and families

http://www.DQOnline.org/
Semiconductor/nanotechnology fabrication training game

FabLab Demo Reel
Envisioning collaborative virtual worlds 2010-2012

Virtual Life Demo Reel
Nanotech design environment for K-12
Spherical data visualization and “spherecasting” support: *NOAA Science on a Sphere* installation in *Opensim*
Partnership between UCI, EON Reality, and others
Goal: Develop cyberinfrastructure for networked learning game environments

MMOLG Web 3.0 System

Tier 1: Individual player connection: your Internet connection at home.

Tier 2: Local institutional connection: library, science center, museum, school.

Tier 3: Regional science/technology center provides local exhibit content connected online.

Tier 4: “Gateway” science/technology centers provide open interfaces and extensible content.

Tier 5: Science/Technology CGVW Grid: **Massive Multiplayer Online Learning Games and collaboration infrastructure** for science/technology education and training.
Game development concepts

- Games as systems
- Components
  - Game engine, user interface, database, networking
- Game space
  - Establishes game look and feel, storyline.
- Rules of play
  - Controls game engine, mediates UI and database
- Goals and choices
- Core play mechanics
Mission management game space
Loose analogy: Simulator interfaces for immersive CGV motorsports racing experiences – how much to invest to achieve what level of outcome/realism?
Mission management scheduling concepts

- Part of recurring planning and scheduling process

- P+S Process includes:
  - Initial plan preparation, resource/task assignment (scheduling), resource conflict/optimization analysis and load balancing, plan enactment, plan execution exigencies and breakdowns, plan breakdown diagnosis, incremental replanning and rescheduling, plan archiving, analysis, reuse and tailoring.
  - *Domain-independent* and *domain-specific heuristics* needed for optimization, balancing, breakdown diagnosis, replanning and rescheduling.
Mission management scheduling related games

  - **Genre**: Space flight combat simulator and resource trading games
  - **Core play mechanic**: Fly to remote planets, deal with obstacles or opponents in route, then acquire resources and skill points through trading or combat
  - **Genre**: Resource trading and accumulation Tycoon/Entrepreneur game
  - **Core play mechanic**: Travel to destinations, assess resource harvesting opportunities and barriers, acquire resources through skill investments and resource trading
- *Texas Hold 'em* (traditional)
  - **Genre**: 7 card Poker game
  - **Core play mechanic**: resource betting, hedging, and bluffing in presence of emerging private scoring position and shared/community resources with uncertain future positions
Elite 1984
Elite (OOlite) example – route planning
### Wing Commander: Privateer

#### Example -- Storyline

<table>
<thead>
<tr>
<th>Image</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Main Menu" /></td>
<td>You are a freelance pilot on the Kilrathi frontier.</td>
</tr>
<tr>
<td><img src="image2" alt="You are a freelance pilot on the Kilrathi frontier" /></td>
<td>The game starts in a base located in the Troy system.</td>
</tr>
<tr>
<td><img src="image3" alt="You can buy/sell ships at the ship dealer" /></td>
<td>You can buy/sell ships at the ship dealer.</td>
</tr>
<tr>
<td><img src="image4" alt="Commodity exchange to buy/sell goods" /></td>
<td>Commodity exchange to buy/sell goods.</td>
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<tr>
<td><img src="image5" alt="Oxford" /></td>
<td>Talk to Breslau and Mercenaries’ Guild.</td>
</tr>
<tr>
<td><img src="image6" alt="Ship Upgrade/Repair" /></td>
<td>Ship Upgrade/Repair.</td>
</tr>
<tr>
<td><img src="image7" alt="Your ship navigation computer" /></td>
<td>Your ship navigation computer.</td>
</tr>
<tr>
<td><img src="image8" alt="Firing all the four guns to the enemy target" /></td>
<td>Firing all the four guns to the enemy target.</td>
</tr>
<tr>
<td><img src="image9" alt="Heading to an agricultural planet" /></td>
<td>Heading to an agricultural planet.</td>
</tr>
<tr>
<td><img src="image10" alt="You will visit the bars alot throughout the game" /></td>
<td>You will visit the bars alot throughout the game.</td>
</tr>
<tr>
<td><img src="image11" alt="Enter name and callsign" /></td>
<td>Enter name and callsign.</td>
</tr>
<tr>
<td><img src="image12" alt="At the bar" /></td>
<td>At the bar.</td>
</tr>
<tr>
<td><img src="image13" alt="The mission terminal" /></td>
<td>The mission terminal.</td>
</tr>
</tbody>
</table>
EVE Online example – UI Dashboard
Industry Giant II example – situation awareness
Industry Giant II example – resource management opportunities
Industry Giant II – resource targeting
Industry Giant II – resource status

Planes such as the McDonnell Douglas DC-10 served as models for this one. They were slightly smaller than the Boeing 747 and had a shorter air-time. They were equipped with three modern, silent low-consumption bypass engines. Apart from the passenger version, there was also a combined freight and passenger plane, another one with increased air-time and a version which served as a refueller and freighter for the USAF.

- Purchase price: 410,000
- Operating costs: 60
- Max. speed / mph: 364
- Max. load: 16
- Repair costs: 270
- Transmission type: Kerosene
Texas Hold 'em example
Some observations

- Visualize resources, resource properties, resource constraints, and resource flow dependencies both in (a) game space and (b) player user interface
- Provide players private and shared progress scores, opponent stats, and other feedback to influence their decision-making
- Visualize opponent spatial positions and anticipated resource positions
- Provide dynamic and competitive uncertainty situations shaping players' course of action
- Provide storyline arc that highlights goals, expected obstacles and competitor positions, and consequences of outcomes (desired and undesired).
Game space redux
Game space redux
Game development issues and opportunities

- Specify, design, prototype and analyze Mission Management scheduling game
  - Incorporate mission management planning and scheduling process concepts, rules, and constraints
  - Develop game space and play rules
  - Develop play/use case scenarios for single or multiple players
  - Incorporate “some observations”
- Develop game architecture
- Develop new or mod existing game engine
Potential Research Deliverables

- Mission management scheduling game concepts
- Game architecture and prototype
- Game design artifacts
- Usage scenarios and storyline
- Worked examples, goals, and rules
- Online tutorials
Discussion and Conclusions

- Computer games and virtual worlds can become an *engine of innovation* for aerospace and defense communities.
- CGVWs is an emerging area for strategic R&D investment, enabling new program initiatives.
- CGVWs represent an area for outreach and future workforce development.
- UCI is making a strategic investment to establish new research center, laboratories, and new undergrad degree in *Computer Game Science*.