

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
 - *Elite* (1984) and *Wing Commander* (1993)
 - *Eve Online* (2007)
 - *Industry Giant II* (2003)
 - *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*

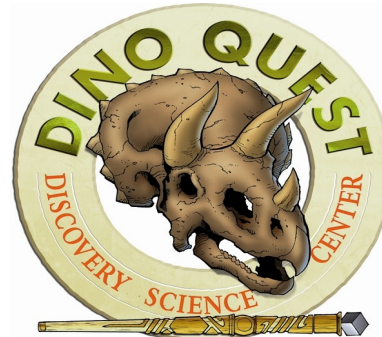
Recent CGVW Projects at UCI

- 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



 **DinoQuest Research Team and Collaboratories:**
Diverse Science Role Models (ethnicity, age, gender)



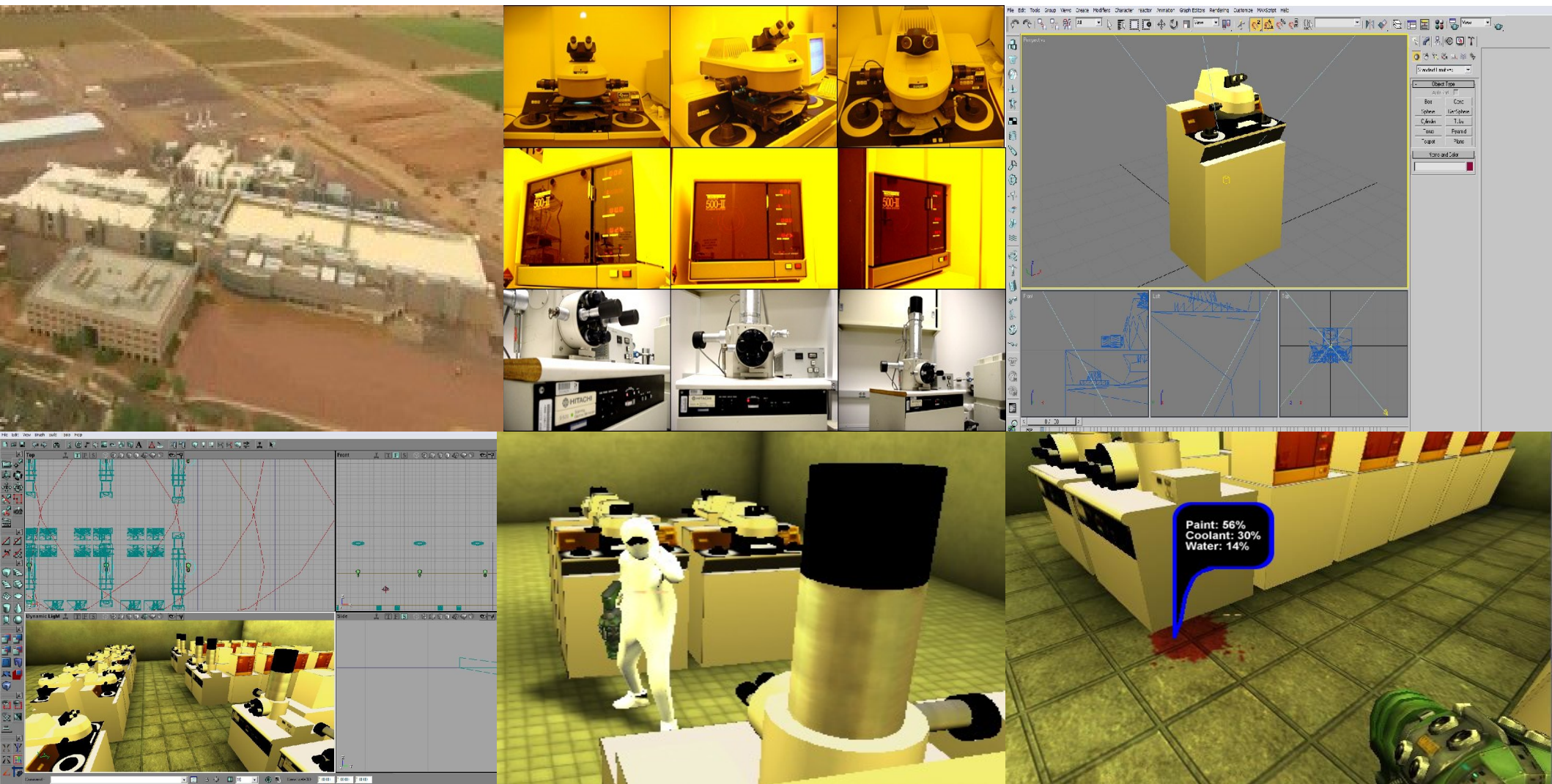
<http://www.DiscoveryCube.org/>

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

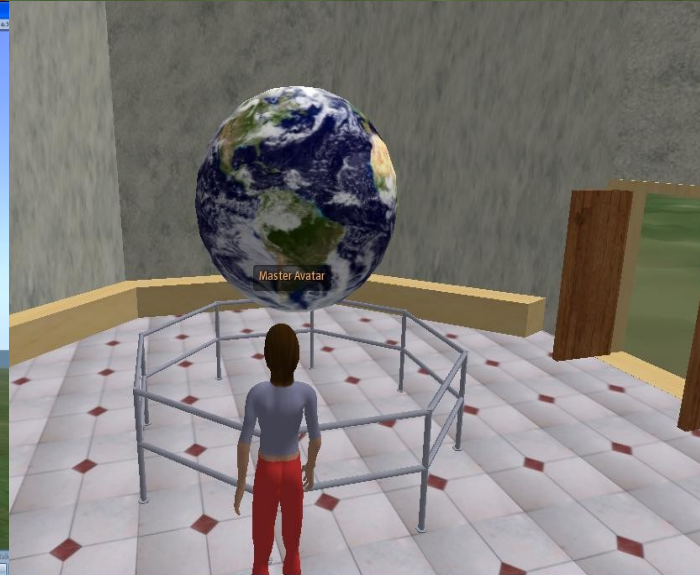
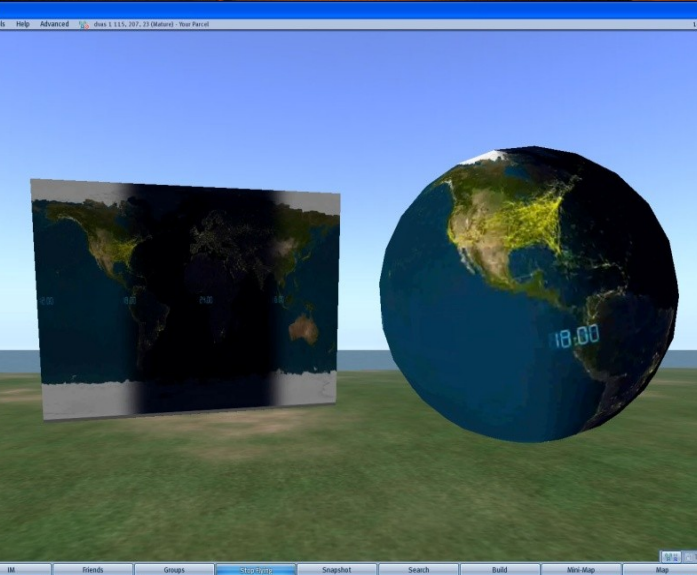
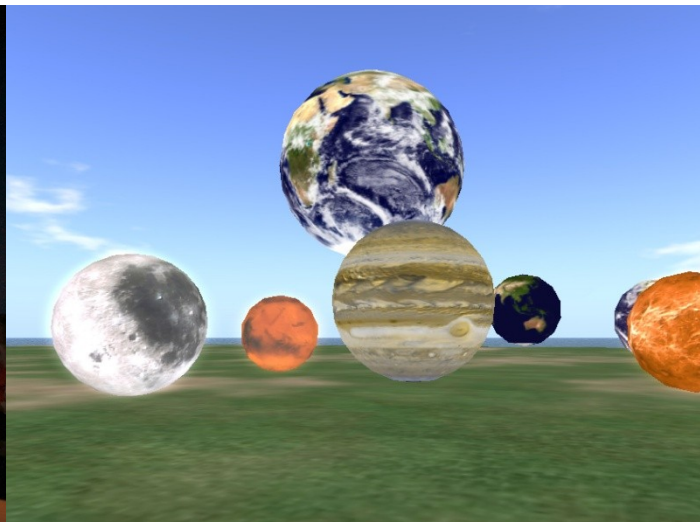


Virtual Life Demo Reel

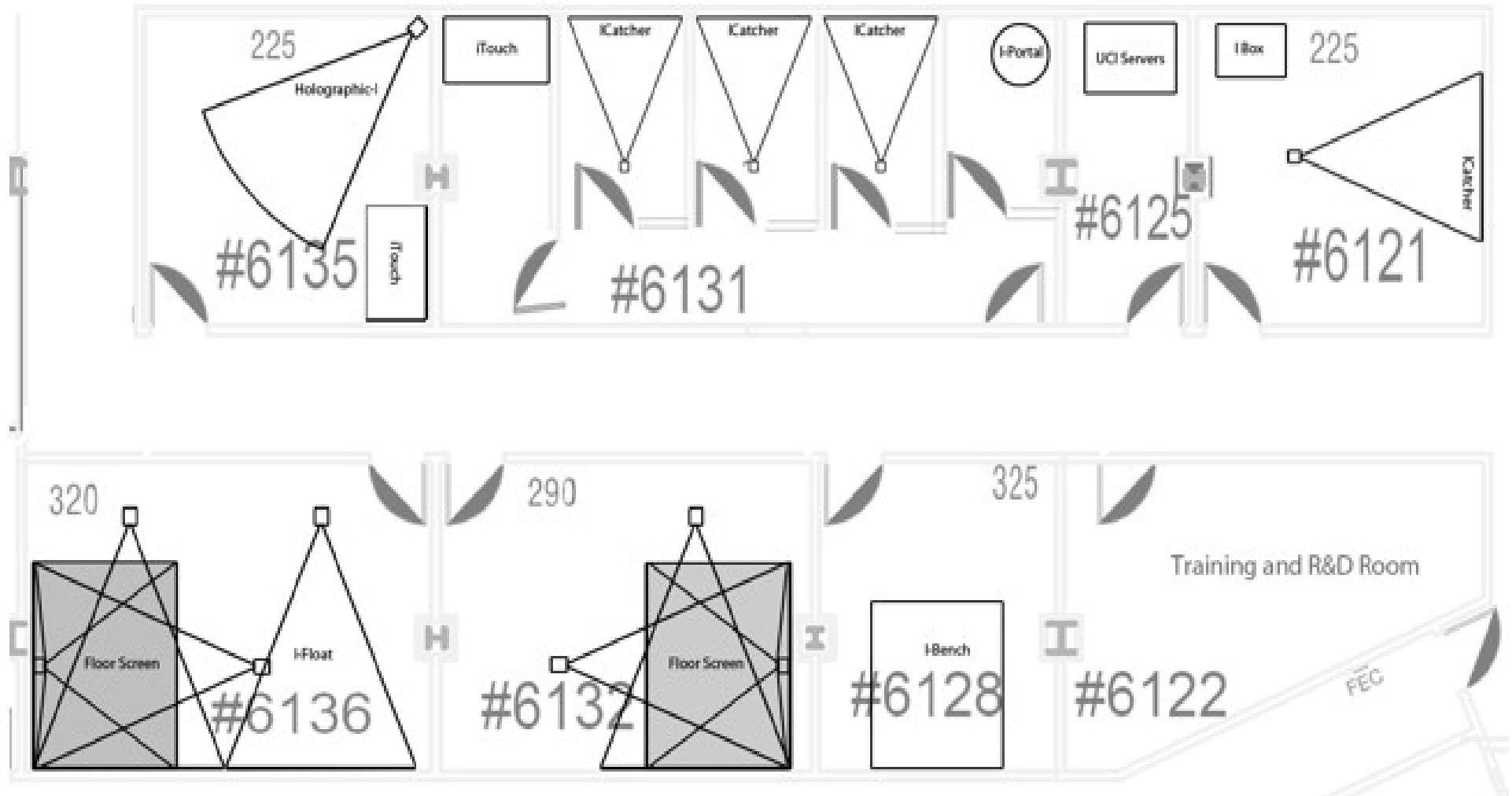
Nanotech design environment for K-12



Spherical data visualization and “sphererecording” support: *NOAA Science on a Sphere* installation in *Opensim*

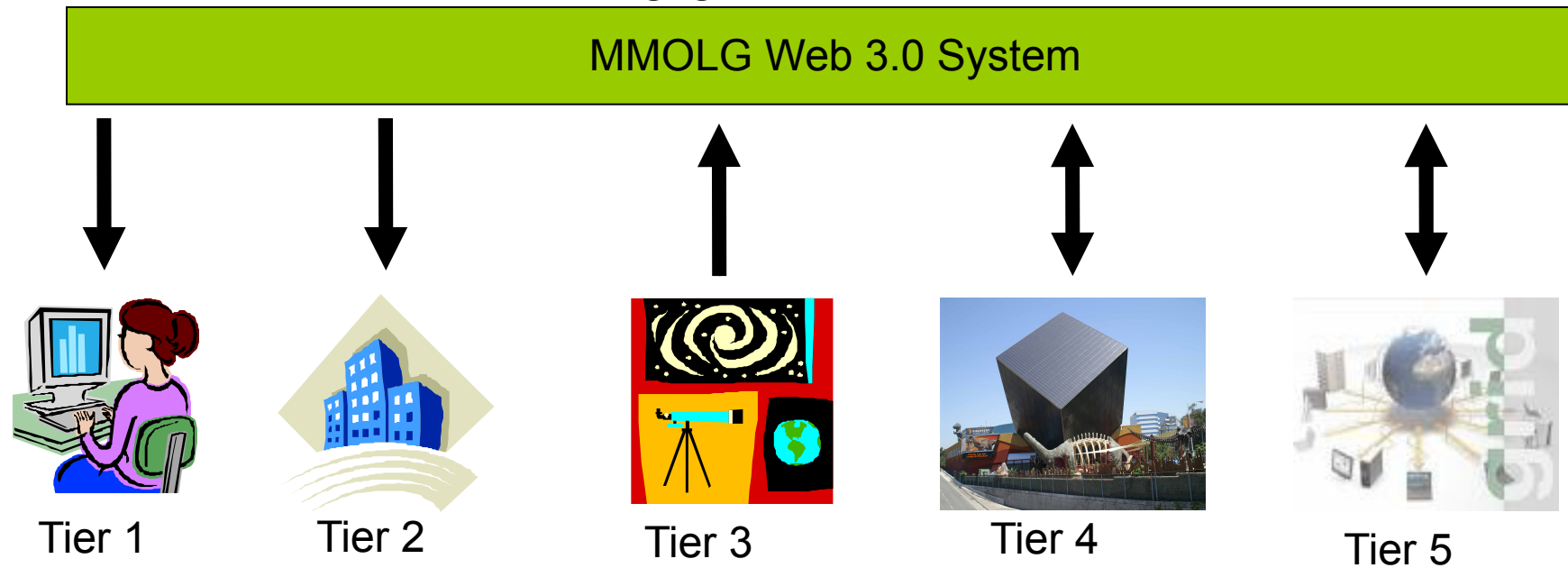


UCI Cyber-Interaction Observatory: A Gateway CGVW R&D Laboratory



Partnership between UCI, EON Reality, and others

Goal: Develop cyberinfrastructure for networked learning game environments



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.

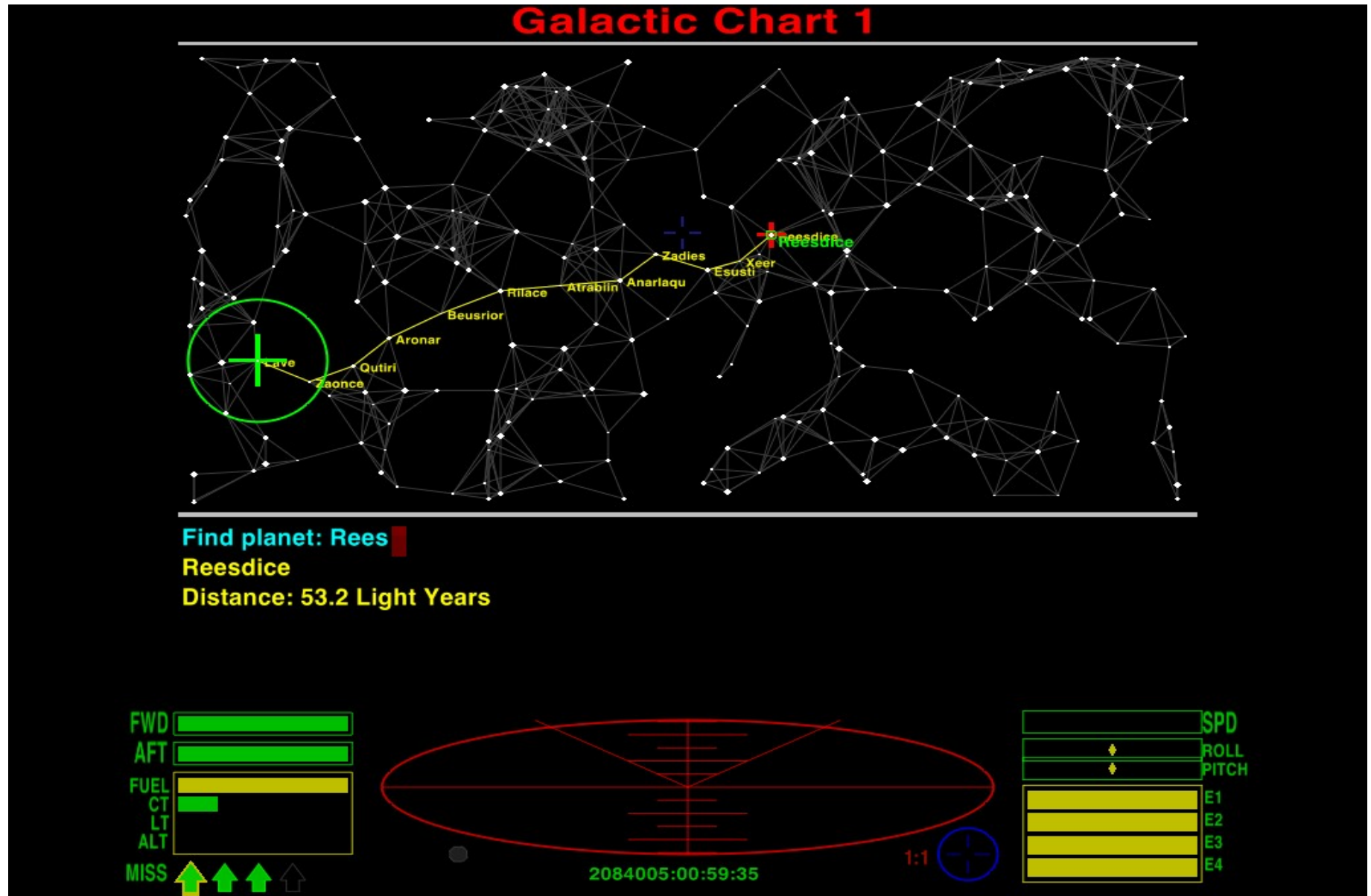
Mission management scheduling related games

- *Elite* (1984) – *Wing Commander* (1993) – *EVE Online* (2007)
 - *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
- *Industry Giant II* (2003)
 - *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

Wing Commander: Privateer



Main Menu



You are a freelance pilot on the Kiltrathi frontier



The game starts in a base located in the Troy system.



You can buy/sell ships at the ship dealer



Commodity exchange to buy/sell goods



Oxford



Talk to Receptionist
Mercenaries' Guild



Ship Upgrade/Repair



Your ship navigation computer



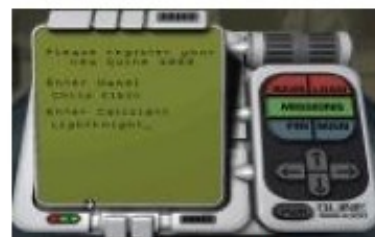
Firing all the four guns to the enemy target



Heading to an agricultural planet



You will visit the bars alot throughout the game



Enter name and callsign



At the bar



The mission terminal

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

Lexicon - McDonnell Douglas-Donell DC 10

Choose category

Select vehicle category

Select vehicle

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

10,000,000 Luxury pts.: 0 01. May, 1982

Texas Hold 'em example



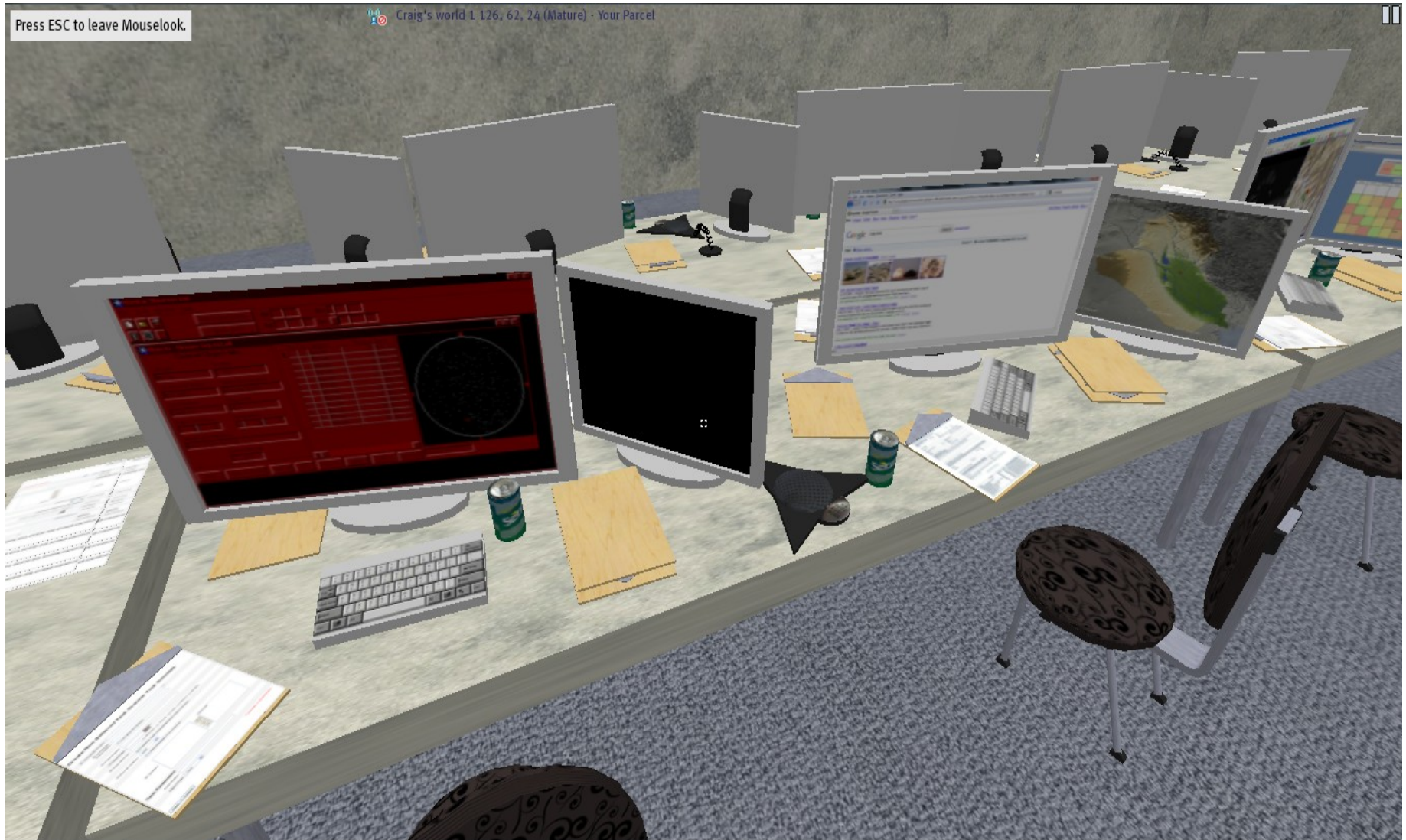
Some observations

- 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*.