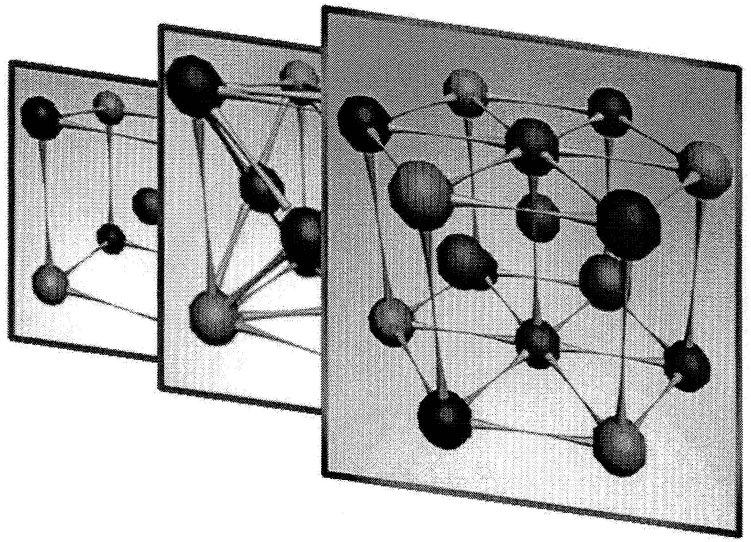
Game Development for Engineering Education

by

Rasha Morsi

GAME DEVELOPMENT FOR ENGINEERING EDUCATION



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OUTLINE

- Game Development (Process)
- Game Development Tools
- Implementation Tools
- Materials Education Game Environment
- Virtual Cleanroom
- E-learning as game-like environments
  - + CLDT
  - + CPR Tool

GAME DEVELOPMENT

- Development requires a number of steps – from initial idea to released product:

The Game idea	Game Play
Genre	Computer AI
Story and Plot Elements	Story Elements
Game Design Document	Sound and Music
The Core Engine	User Interface
Level and Graphic Design and Integration	Testing and Debugging

MY GAME DEVELOPMENT HISTORY

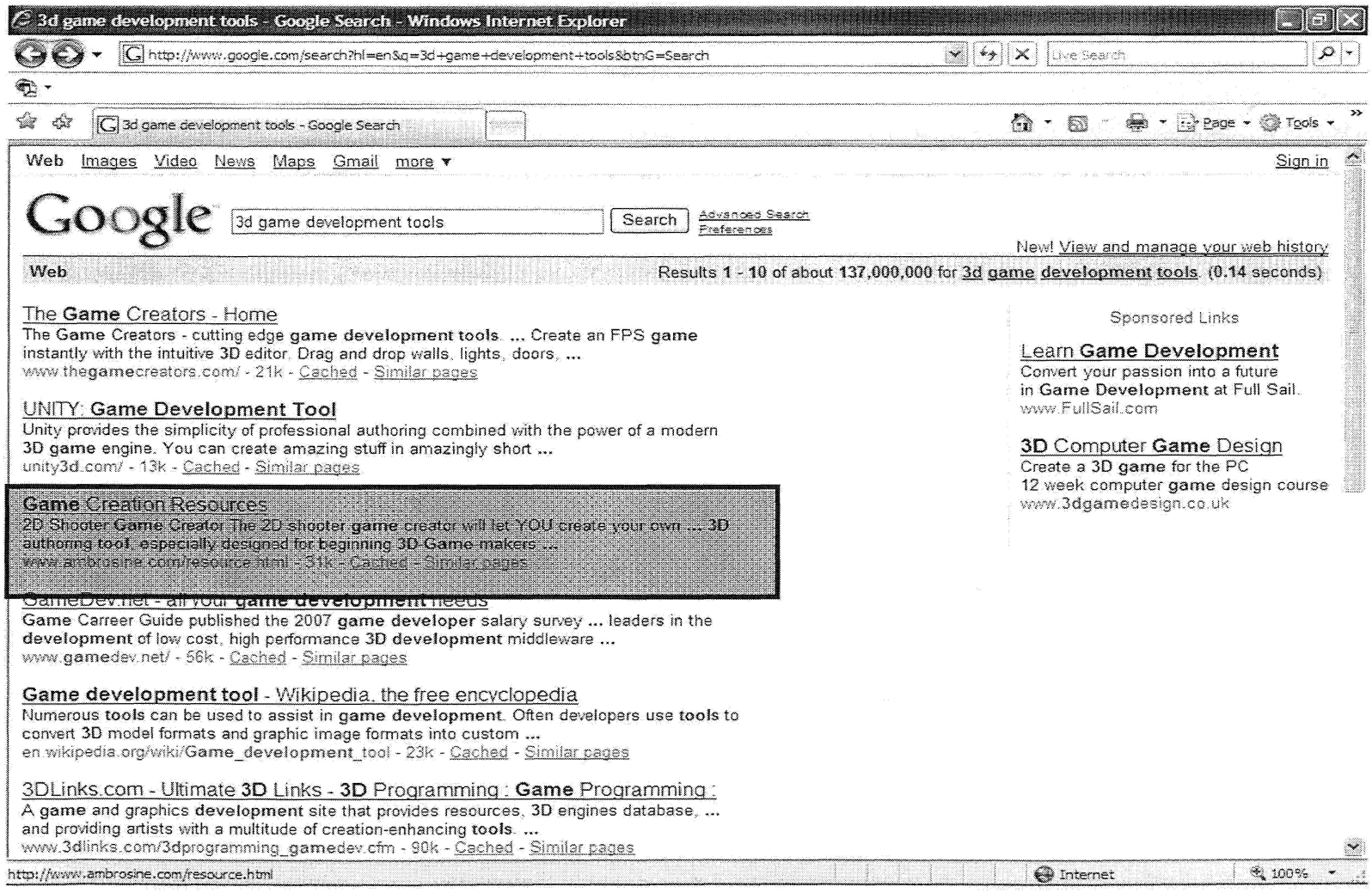
- Started game development in 2005
- Questions asked:
  - + What tools are out there?
  - + What do I need to know to develop a 3D computer game?
  - + What about XBox games? Playstation, Wii (recently)
  - + Where do I find these things?

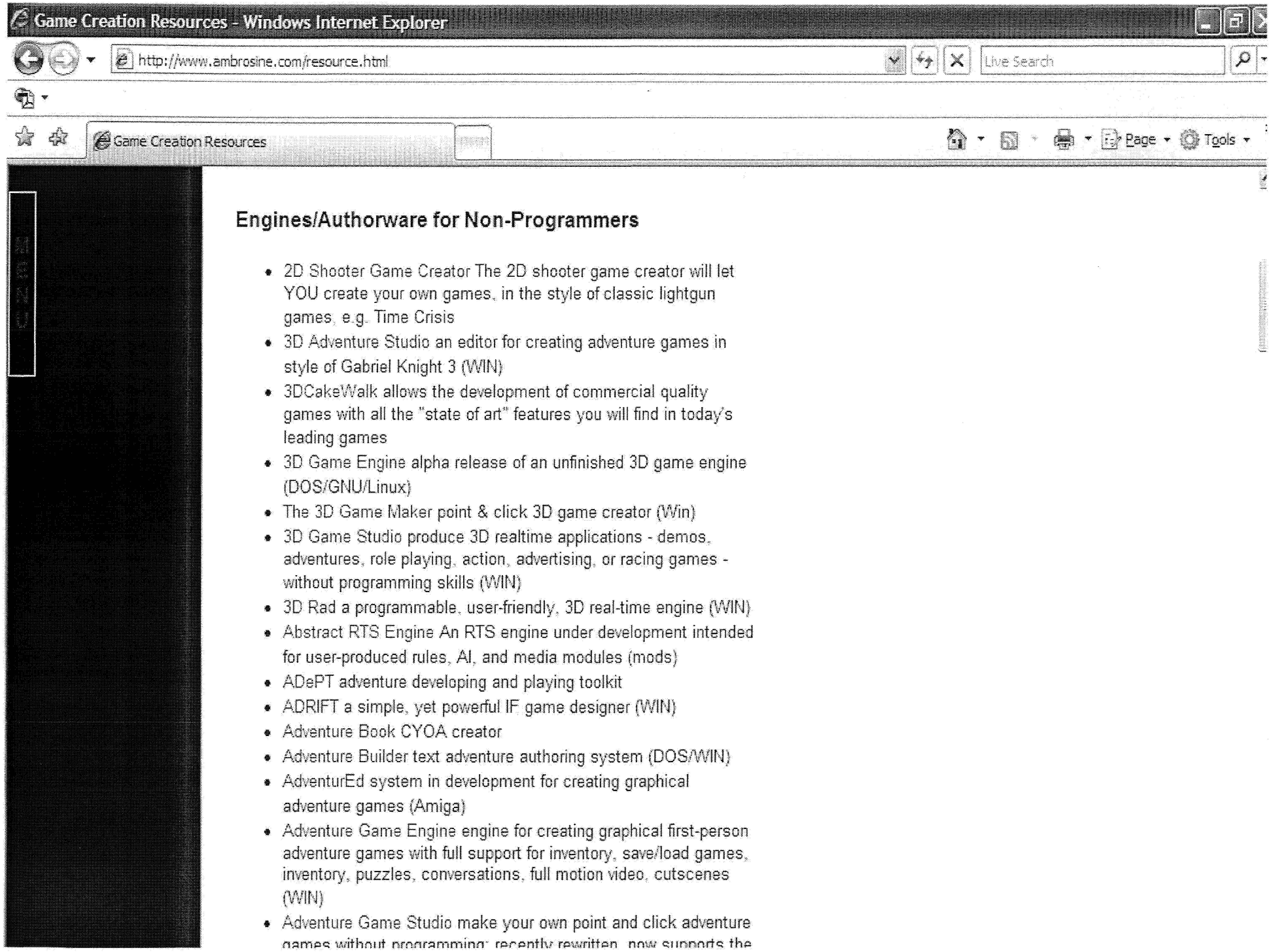
+Google search!!!

- × Google is now a verb in the Oxford English Dictionary!

GOOGLE SEARCH!

- Search “3D game development tools”





Engines/Authorware for Non-Programmers

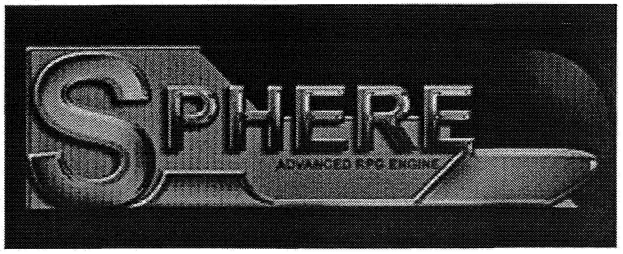
- 2D Shooter Game Creator The 2D shooter game creator will let YOU create your own games, in the style of classic lightgun games, e.g. Time Crisis
- 3D Adventure Studio an editor for creating adventure games in style of Gabriel Knight 3 (WIN)
- 3DCakeWalk allows the development of commercial quality games with all the "state of art" features you will find in today's leading games
- 3D Game Engine alpha release of an unfinished 3D game engine (DOS/GNU/Linux)
- The 3D Game Maker point & click 3D game creator (Win)
- 3D Game Studio produce 3D realtime applications - demos, adventures, role playing, action, advertising, or racing games - without programming skills (WIN)
- 3D Rad a programmable, user-friendly, 3D real-time engine (WIN)
- Abstract RTS Engine An RTS engine under development intended for user-produced rules, AI, and media modules (mods)
- ADePT adventure developing and playing toolkit
- ADRIFT a simple, yet powerful IF game designer (WIN)
- Adventure Book CYOA creator
- Adventure Builder text adventure authoring system (DOS/WIN)
- AdventurEd system in development for creating graphical adventure games (Amiga)
- Adventure Game Engine engine for creating graphical first-person adventure games with full support for inventory, save/load games, inventory, puzzles, conversations, full motion video, cutscenes (WIN)
- Adventure Game Studio make your own point and click adventure games without programming; recently rewritten, now supports the

- Too many products out there!
- Some free and some not…
- Which one do I choose? What will my students' learning curve be? Etc..
- So, categorized them
  - + Game Development Tools
  - + Implementation tools

GAME DEVELOPMENT TOOLS

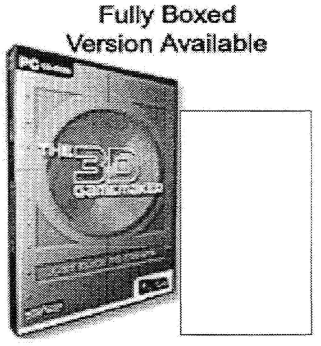
- 2D game development tools
  - Game Editor

    - interactive multimedia tool for game development
    - simple and intuitive interface
    - develop 2D games for personal computers and mobile devices!
  - Sphere
    - 2D RPG (Role Playing Game) engine
    - allows people with not much programming experience to create role-playing games

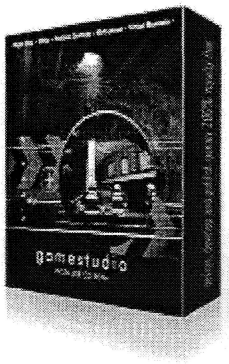


3D game development tools

- *3D Game Maker*
  - uses a point and click interface
  - simple to use
  - allows one of 8 genres
  - pick from pre-made characters
  - good for developing games by changing set capabilities

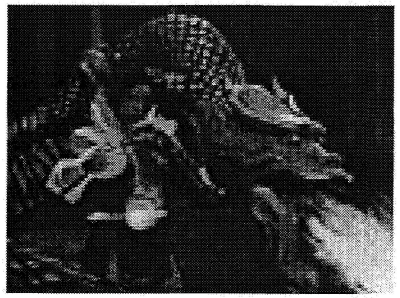


- 3D Gamestudio
  - number of versions with increased capability
  - development system for virtual worlds, simulations and 2D and 3D computer games.
  - combines lite-C programming language and
    - a high end 3D engine and a 2D engine,
    - a physics engine,
    - level, terrain and model editors,
    - a template system for creating games without programming, and
    - huge libraries of 3D objects, artwork and ready-assembled games.



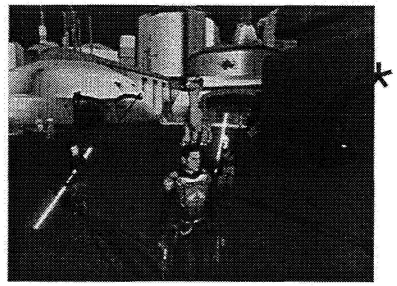
GAME IMPLEMENTATION TOOLS

- Game Environment Creation
  - 3D Rendering systems
    - Autodesk 3Ds Max
      - generate realistic characters
      - create rich and complex design visualization
      - used for shading, texturing, lighting, and rendering on projects ranging from feature films to television commercials to music videos



Jade Empire - Bioware

    - Autodesk® Maya®
      - software is a powerful, integrated 3D modeling, animation, effects and rendering solution
      - used for modeling and creature work



Star Wars: Knights of the old republic - Bioware

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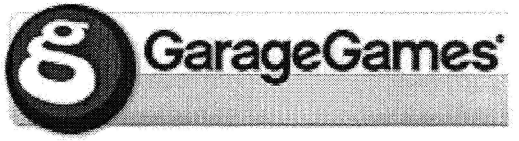
Image courtesy of Industrial Light & Magic

Forza Motorsport - Microsoft

Gaming Engines

- Delta3D (open source)
  - Full gaming engine
  - Includes 3D environment editor

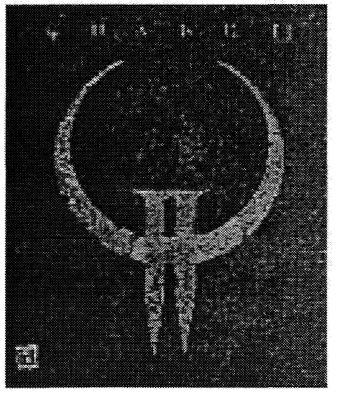
- **GarageGames' Torque**
  - whole game development approach
  - provide the technology, framework, methodology, tools where you provide the creativity and the drive to make your game.



- Irrlicht Engine (free)
  - open source high performance realtime 3D engine
  - written and usable in C++
  - completely cross-platform, using **Direct3D** and **OpenGL**
  - character animation system
  - powerful, customizable and easy to use **2D GUI System** with Buttons, Lists, Edit boxes

Gaming Engines for console game development

- Microsoft's XNA Game Studio Development Express (free),
  - cross platform Next generation Architecture
  - will enable any one to make a game for the Xbox 360 and Windows XP platforms.
  - developed games can be distributed with the free XNA Framework to be able to run the games
- idTech2 (Quake 2 gaming engine)
  - open source
  - 3D environments
  - software renderer
  - colored lighting effects



- The UnrealEngine2 Runtime: Demo Version
  - for non-commercial and educational use
  - cross-platform, real-time 3D rendering solutions
  - Runtime provides a stable, robust platform for interactive walkthroughs and simulations.

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CURRENT PROJECTS

MATERIALS EDUCATION GAME ENVIRONMENT

- Materials Education Game (MEG) environment is an environment that was developed for use in a Materials Science educational game.
- This environment uses the principles of gaming for teaching a core concept in Materials Engineering.
- Autodesk's 3dsMax was used for the graphics generation and animation.

Top Floor
Bottom Floor

testGUI

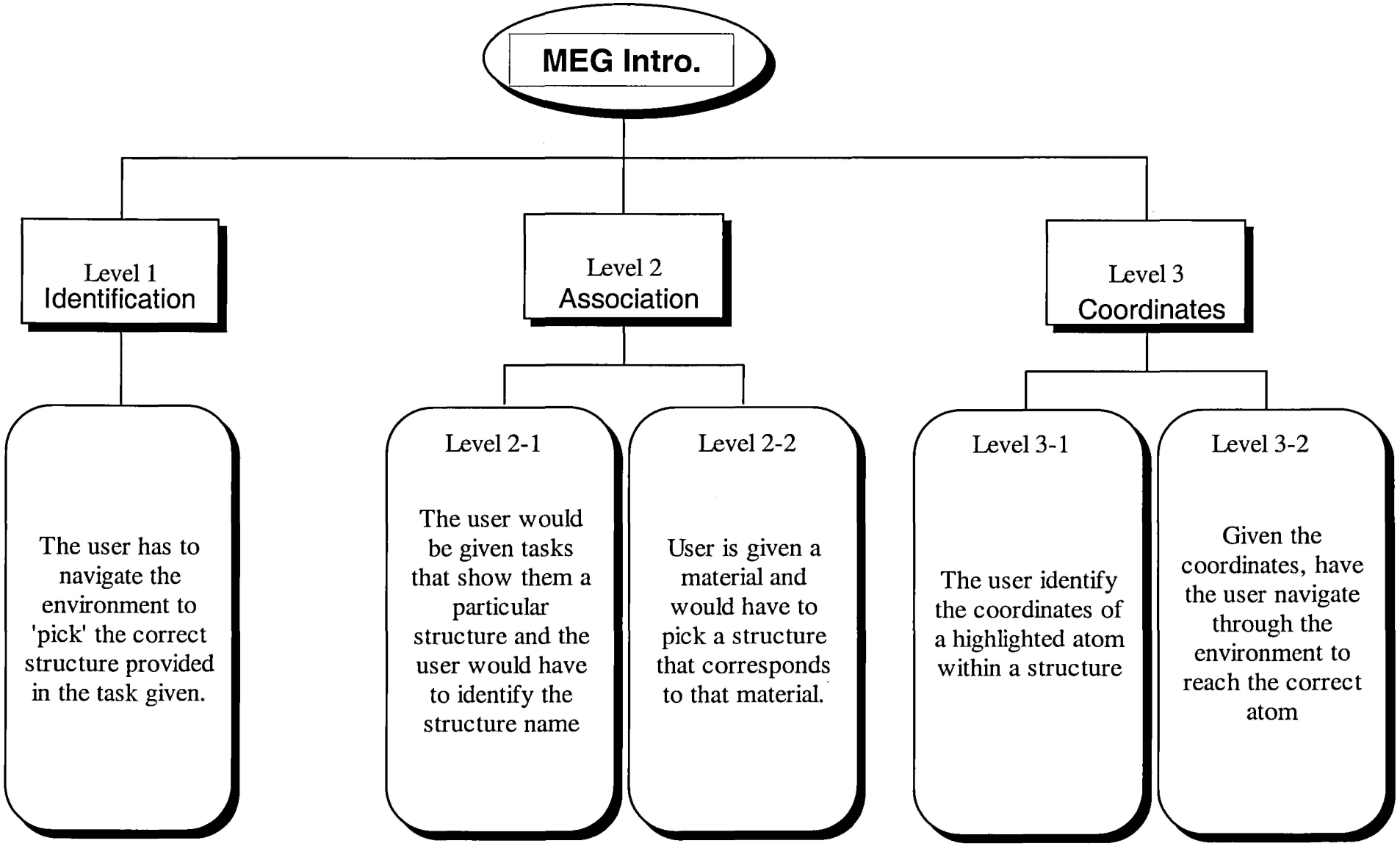
Top Floor

FCC

BCC

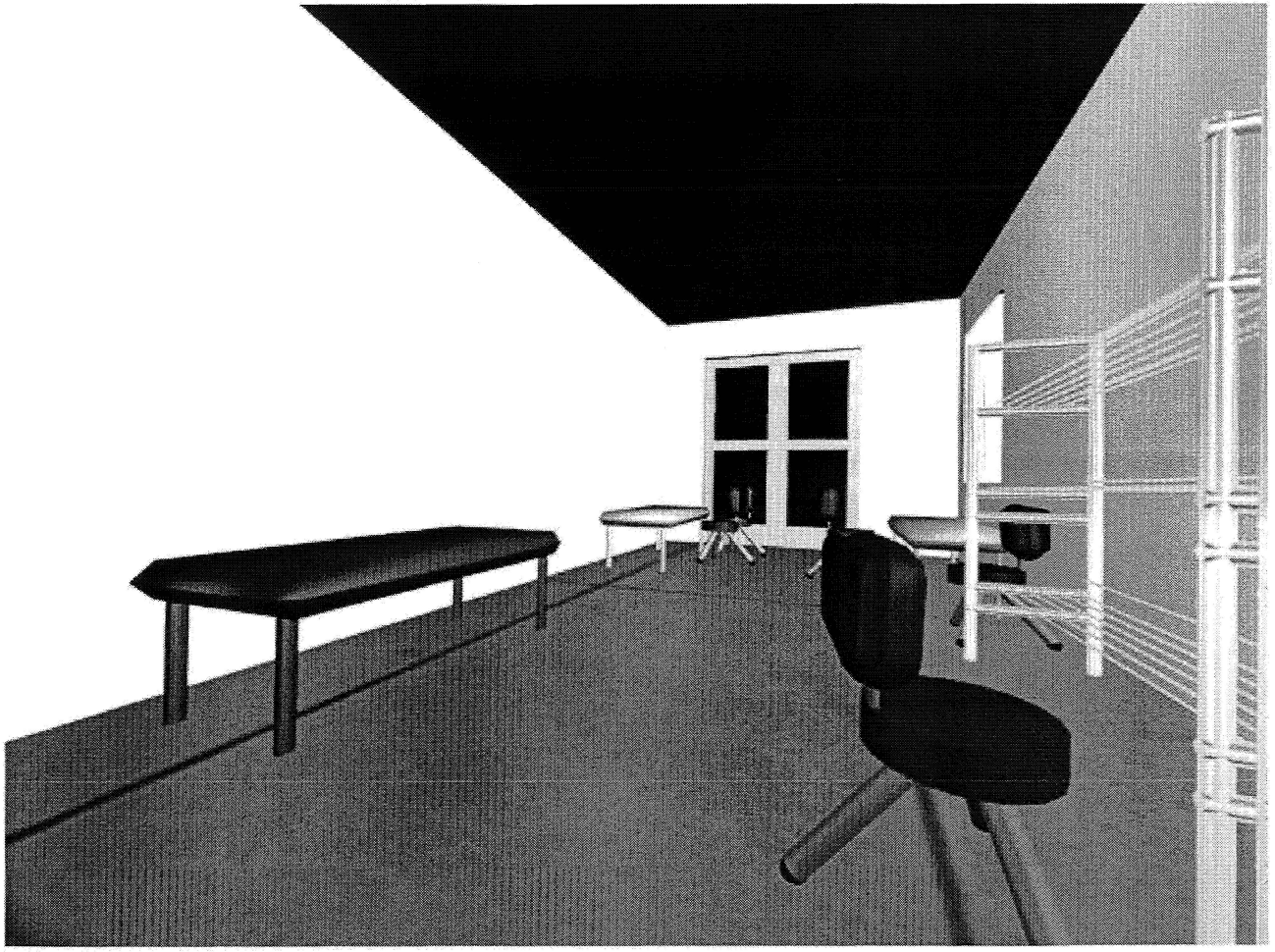
HCP

SAMPLE GAME LEVEL INTEGRATION



Demonstration

INTERACTIVE VIRTUAL CLEANROOM ENVIRONMENT



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E-LEARNING

- E-learning as game-like environments
  - + Take a fully functional e-tool and add a timer: for example, creates a game-like environment where students can use the tool to see how quickly they can answer the questions.
  - + Creates a competitive environment while at the same time assessing the student knowledge.
  - + Also, providing success rate allows use in the classroom by teachers for assessment.

COMBINATIONAL LOGIC DESIGN TOOL (CLDT)

- CLDT implements a novel approach to online learning which is the development of *web-based online practice tools*.
  - + randomly generate problem statements
    - × (not randomly choose from a list) and
  - + allow students to solve problems through a step-by-step process
  - + Assess responses at each step 'Just In Time' (JIT)
- Built using Adobe Macromedia Flash ActionScript
- Portable and web-based → available any time, anywhere

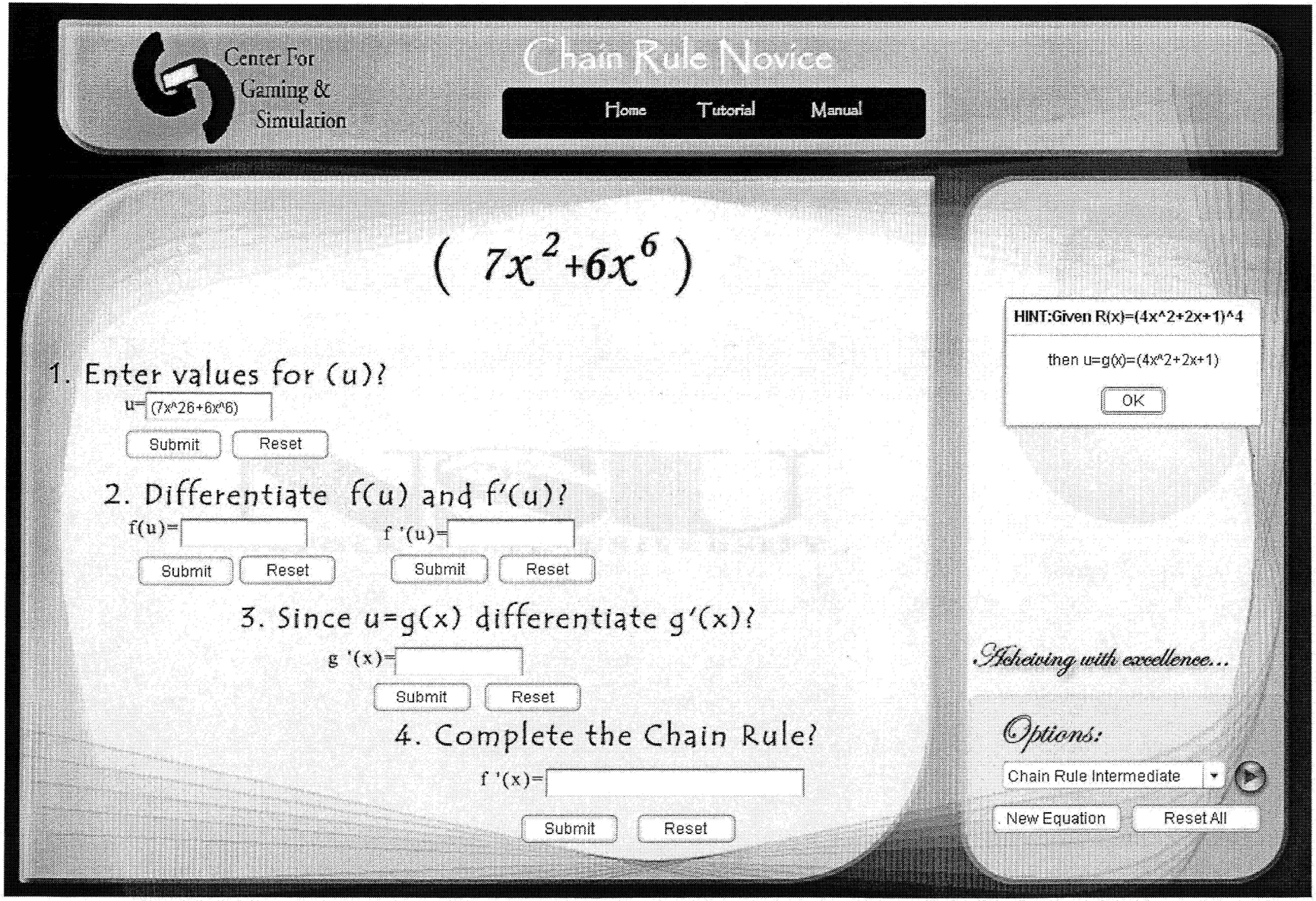
CLDT USER TOOL OPTION

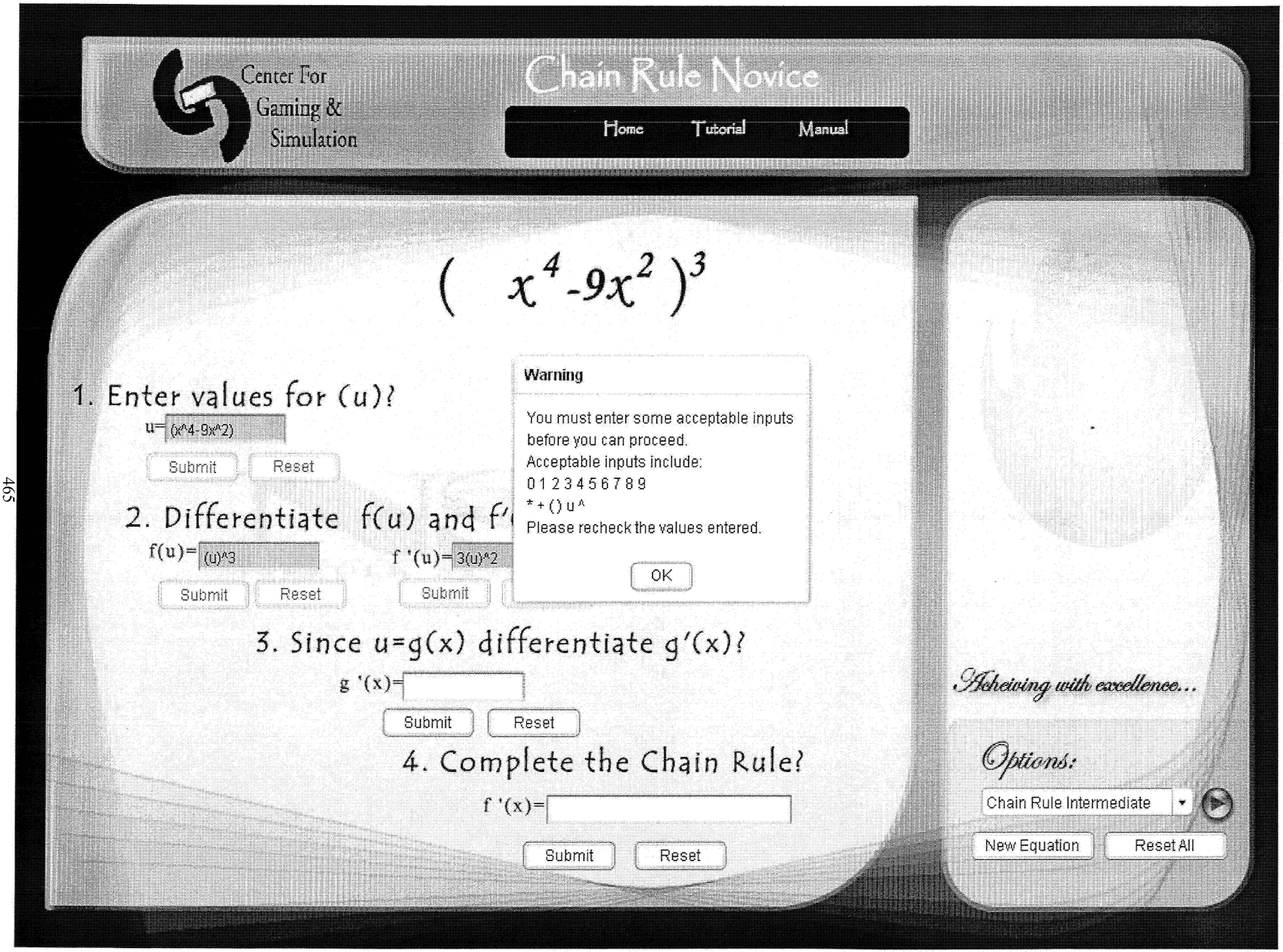
Demonstration

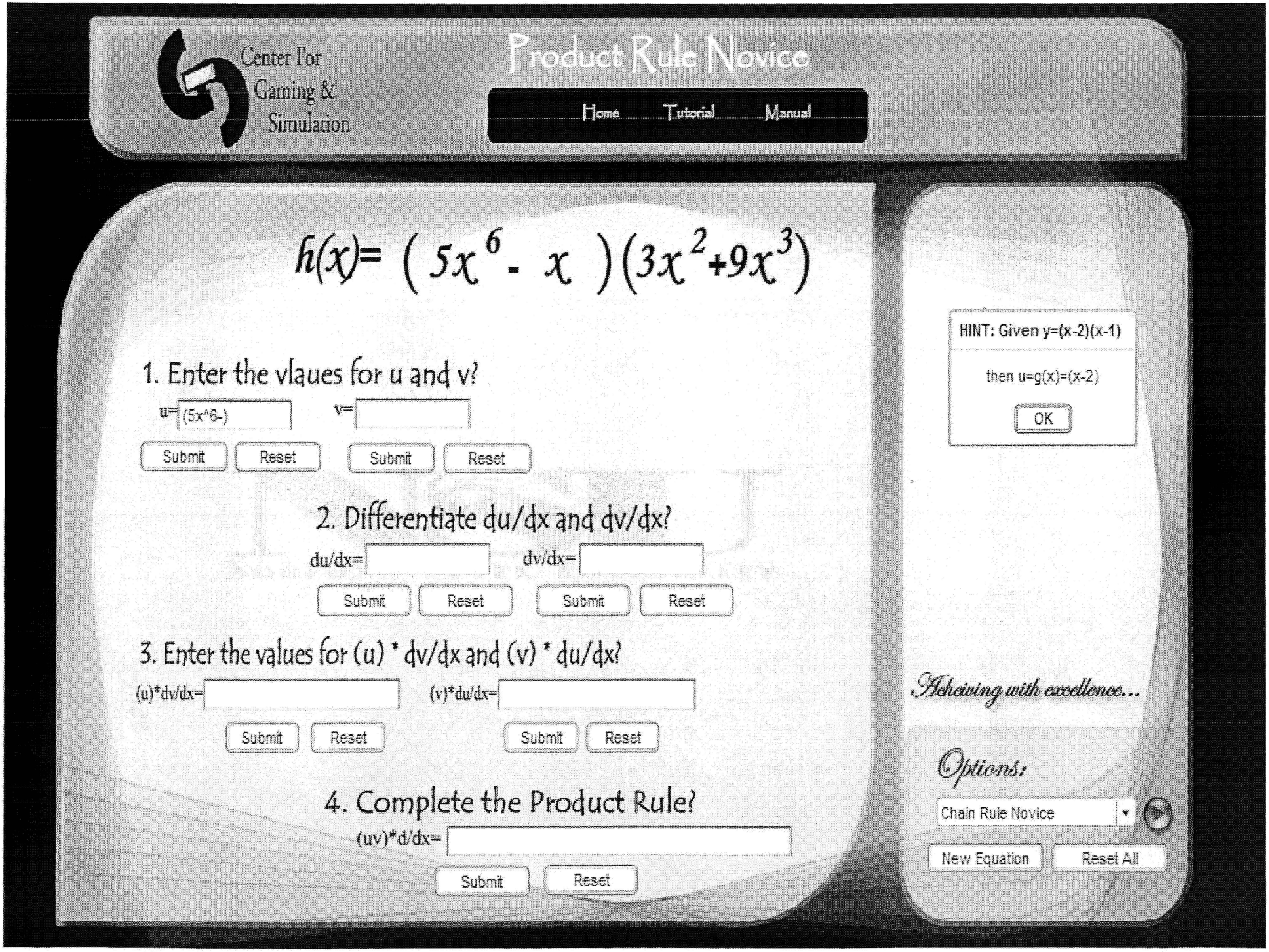
OTHER E-TOOLS DEVELOPED

- Chain and product rule tools (college calculus level)
- Again, adding timers and providing success rate make for a game-like environment

HINT EXAMPLE




Center For Gaming & Simulation
Chain Rule Novice
Home
Tutorial
Manual
$(x^4-9x^2)^3$
1. Enter values for (u)?
u= (x^4-9x^2)
Submit
Reset
Warning
You must enter some acceptable inputs before you can proceed.
Acceptable inputs include:
0 1 2 3 4 5 6 7 8 9
* + ( ) u ^
Please recheck the values entered.
OK
2. Differentiate f(u) and f'
f(u)= (u)^3
f '(u)= 3(u)^2
Submit
Reset
Submit
3. Since u=g(x) differentiate g'(x)?
g '(x)=
Submit
Reset
4. Complete the Chain Rule?
f '(x)=
Submit
Reset
Achieving with excellence...
Options:
Chain Rule Intermediate
New Equation
Reset All


Center For Gaming & Simulation
Product Rule Novice
Home Tutorial Manual
h(x)= (5x^6 - x)(3x^2+9x^3)
1. Enter the vlaues for u and v?
u= (5x^6-)
v=
Submit Reset Submit Reset
2. Differentiate du/dx and dv/dx?
du/dx=
dv/dx=
Submit Reset Submit Reset
3. Enter the values for (u) * dv/dx and (v) * du/dx?
(u)*dv/dx=
(v)*du/dx=
Submit Reset Submit Reset
4. Complete the Product Rule?
(uv)*d/dx=
Submit Reset
HINT: Given y=(x-2)(x-1)
then u=g(x)=(x-2)
OK
Achieving with excellence...
Options:
Chain Rule Novice
New Equation Reset All

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Questions?