Games are “serious business”

- Facts from [www.esa.org](http://www.esa.org):
  - $7.4 billion revenues in 2006
  - Average player is 33 years old and has been playing for 12 years
  - 36% percent of American parents play computer
  - 80% percent of gamer parents play with their kids
- From Blizzard press release:
  World of Warcraft surpasses 10 million subscribers in January 2008
  - $13 to $15 monthly (for 2.5 million in U.S. at least)
  - Do the math!!!
- Stephen Johnson, “Everything Bad is Good for You: How Today’s Popular Culture Is Actually Making Us Smarter”

Our MPG class fills an industry need

- “CPU/GPU programming skill is the biggest hole they have. They can’t find students who can do it well.” - Prof. Blair MacIntyre
- “The biggest challenge facing game companies right now is the problem of writing multithreaded code that fully supports the multiple-core architectures of the latest PCs and the next generation game consoles.” - Jeremy Reimer, “Valve goes multicore”
- “If a programming genius like John Carmack can be so befuddled by mysterious issues coming from multithreaded programming, what chance do mere mortals have?” - Jeremy Reimer, “Cross-platform game development and the next generation of consoles”

The realities of real-time

- The architectures we will look at are driven by real-time constraints
  - 60 frames per second
  - 1/60 ≈ 16.7 milliseconds
  - Average performance is irrelevant; it’s the max that matters
- In contrast, most scientific applications can be handled “offline”
  - Computers historically designed to work well in “batch mode”
- We may briefly discuss exploiting this kind of hardware for scientific applications
  - GPGPU movement
  - Sony’s folding@home
This is NOT a course on game design, or…

- See CS4455: Video Game Design
  - Founded by Amy Bruckman in 1998
- See CS4731: Game AI for the real deal on AI
  - But we may dabble in AI just a little bit
- Also won’t be talking about...
  - Handheld game devices
  - "Alternative" controllers
  - Networking issues (LAN parties, MMORPGs, etc.)
  - Prototyping, user testing
  - Societal impact of games
  - Gender and games
  - Business issues (organizational issues of large teams, etc.)
- May incidentally touch upon some of the above issues

This is WILL be a course on…

- Emphasis will be on games that simulate and depict “realistic” animated 3-D environments
  - Algorithms
  - Architectures
  - Programming paradigms
- Practical target platforms
  - Xbox 360
  - Playstation 3
  - Windows PCs with NVIDIA or ATI graphics cards
  - ...and maybe taste of Playstation 2
- Future target platforms
  - Intel’s Larabee
- What about the Wii?

This is only partially a graphics course

- No background in computer graphics required!
  - Make sure class is accessible to ECE majors
- We will review a minimal amount of necessary background
  - Geometric transformations, backface culling, clipping, rasterization, lighting, texture mapping, etc.
- Emphasis will be on real-time graphics
- We won’t be talking about things like...
  - Perception
  - Global illumination: ray tracing, radiosity, photon mapping
    - Although people are experimenting with putting such algorithms on GPUs!
  - Advanced animation techniques: inverse kinematics

Then vs. Now

- In the early days of computer games, the “designer” and the “programmer” were often one and the same
- Nowadays there are usually separate positions of “producer,” “lead designer,” “lead artist,” “lead programmer,” etc.
Two recurring themes

• Theme 1: Hardware features influence game design
  – If the Atari 400 gives you 4 sprites, you’ll naturally find something to do with those 4 sprites
  – If a Playstation 3 can push a gazillion polygons, developers feel obligated to provide a gazillion polygons
    • Driving budgets through the roof
    • 100 person teams - 30 programmers, 70 artists
    • Trend not sustainable!
    • With all the emphasis on 3-D realism, could great games like Ms. Pac-Man or Balance of Power be made today?

• Theme 2: Sufficient cleverness can sometimes overcome hardware limitations

Taking a broad view of “video games”

• Commercial game industry is brutal
  – Some companies get hundreds of resumes per week per listing (www.gamasutra.com/features/20050711/mcshaffry_01.shtml)

• Think “outside the box” a bit
  – Computer engineering
    • Nothing is driving technological develop as fast as gaming
    • Gaming experience gives future computer engineers insight
    • Maybe you’ll work for NVIDIA or ATI?
    • Maybe you’ll work for Intel, AMD, or IBM?
    • Maybe you’ll help design the Playstation 4 or Xbox 720?
  – “Game” programming/design: think beyond the commercial industry
    • Scientific potential of GPGPU
    • Even if you never program any “games,” **multicore is the future**

• That all said - we’d be totally thrilled if you got a job at Insomniac, Bungie, Blizzard, Activision, LucasArts, etc.

Many opportunities for independent developers

• On-line distribution
  - Takes manufacturing costs out of the equation
  - “Brick & mortar” stores have limited shelf space - on-line services like Amazon, Netflix, etc. can exploit “the long tail”
  - Why are we still shipping boxes mostly full of air?

• Greg Costikyan’s Manifesto! Games

• Jeff Vogel of Spiderweb Software has been crafting “old-school” 2-D and isometric RPGs as his full-time job for over a decade
  - Exile, Nethergate, Averum, Geneforge
  - [www.spiderwebssoftware.org](http://www.spiderwebssoftware.org)
  - Makes house payments, feeds kids

Consoles hostile territory for indie developers (1)

• To sell games on a console, you still must pass the gatekeepers at Sony, Microsoft, and Nintendo

• Code must be “digitally signed” to run
  - Piracy concerns
  - Consoles supposed to provide safe environment
  - Unlike PC users who are used to dealing with viruses, spyware, crashing programs
  - Manufacturers worried about “untrustworthy” code screwing up people’s consoles
  - Want to ensure a uniform, “quality” experience

• They have more lawyers than you
Consoles hostile territory for indie developers (2)

- Nintendo NES “pioneered” business model
  - Typical ell consoles at a loss
  - Charge royalty on units manufactured, not units sold

- For indie developers, online distribution (Xbox Live Arcade, Playstation Network, WiiWare, etc.) seems like the least risky option

“Serious Games”

- Games for “training” and “education”
  - First responders: “Hazmat: Hotzone”
  - Medicine: “Pulse!”
  - Business: “Stone City” for Cold Creamery

- Ian Bogost (LCC) doesn’t like the term “serious games”

“Persuasive Games” & “Games for Change”

- Expand the “Serious Games” notion to include broader categories like “advertising,” (advergame), “propaganda,” “subversion”
- The Howard Dean for Iowa game
- Disaffected! (not authorized by Kinkos)
- America’s Army - training, advertising or propaganda?
  - U.S. government spent $7 million, but free to play
  - made with Unreal Tournament engine

Other real-time applications

- Graphics
  - MRI in the operating room
- Processing
  - Machine vision
    - Toshiba demos: real-time face tracking, markerless motion capture, hand gesture user interface
  - Data compression/decompression
    - New Toshiba HDTVs will use Cell processors
    - Radar signal processing
      - 7 SPE Cells -> PS3s; 8 SPE Cells->Mercury Computing blades
Movie magic

- Hollywood
  - Final ray-traced renderings usually done off-line using "render farms"
  - Continually improving real-time graphics lets moviemakers more easily experiment via "pre-viz"
    - Both on CGI-intensive sequences and live-action sequences
- "Machinima"
  - Fans making films using game engines

[Image: thesims2.ea.com/thesims2_userdata/16303316/movie_myimmortal.wmv]