**CS10**

**The Beauty and Joy of Computing**

Lecture #3: Video Games

2012-06-20

LEAP MOTION: $70?

200x more accurate than Kinect; tracks 10 fingers to 1/100 of a millimeter... by the end of this year

http://engt.co/MAF8FR

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**Video Games: Overview**

- **History**
  - Inventors & Games
- **How**
  - Design
  - 2D & 3D graphics
  - Motion Capture
  - Artificial Intelligence (AI)
- **Good, Bad, Ugly**
  - GWAP, RSI, Violence
- **Future**

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**The Beginning: Spacewar!**

- **First to gain recognition**
  - Others had games before
  - “Conceived in 1961 by Martin Graetz, Steve Russell, & Wayne Weitman”
  - Written for PDP-1 at MIT
  - Inspired lots, widely ported

- **Can still play this!**
  - 1 Working PDP-1 in CHM Java version available

**Documentaries on Video Games**

- **History: Video Games: Behind the Fun (2000)**
- **PBS: The Video Game Revolution (2004)**
- **Discovery: History of Video Games (2006)**
- **ON Networks: Play Value (2009)**
- **ON Networks: The Video Game Revolution (2009)**
- **History of Video Games (WWW)**

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**The Founding Fathers**

- **Nolan Bushnell**
- **Ralph Baer**

www.ontunetworks.com/videos/play-value/the-founding-fathers

(also on iTunes in HD 720p)
Shigeru Miyamoto

- The “Walt Disney” of video games
  - Game designer at Nintendo
  - Inducted into the Hall of Fame
- Designed (among others):
  - Donkey Kong
  - Super Mario Bros
  - The Legend of Zelda
  - Super Mario 64
  - Nintendo DS, Wii

www.oonetworks.com/videos/play-value/shigeru-miyamoto
www.newyorker.com/reporting/2010/12/20/101220fa_fact_paumgarten
www.nytimes.com/2008/05/25/arts/television/25schi.html

Design of a Casual Video Game

- Staff requirements
  - Can be done by one person, like days of old
  - Bigger teams also (< 10)
  - Lots of new developers
- Phones great platforms
  - iPhone dominates field
  - Students are signing up!
- Time to completion
  - Often only a few months!

blog.entertainment.com/2009/07/7-addicting-casual-games
en.wikipedia.org/wiki/Casual_game

% of Parents: “Video games are a positive part of my child’s life”

- a) 22%
- b) 32%
- c) 42%
- d) 52%
- e) 62%

Design of a Core Video Game

- Staff requirements
  - Cross-disciplinary
  - Producer, programmers, game, graphic & sound designers, musicians, testers, ...
  - 100+ person teams
- Similar to film
  - Often, games->film, and film->games
  - Lucasfilm, etc. want to tie assets together

en.wikipedia.org/wiki/Video_games

How: 3D Computer Graphics

- Similar to making a 3D animated film...
  - Model characters, environment in 3D
  - Add shading, lights, effects, behavior
  - Let 3D rendering engine (on graphics card) do the work of figuring out 2D scene from 3D
- Limitations
  - Many things are too “expensive” to do in 30 frames per second
  - Research breakthroughs!

en.wikipedia.org/wiki/Potential_of_computer_graphics
www.siggraph.org

How: Motion Capture

- Actors in MoCap suits
- Motions recorded, put in “motion libraries”
  - E.g., running, throwing, passing, tackling
  - Can be edited/cleaned
  - Motion synthesis also
- Challenges
  - Motion “blending”
  - Non-“sliding” feel
  - UC Berkeley Research!

en.wikipedia.org/wiki/Motion_capture
www.phasespace.com
How: Artificial Intelligence

- Range of intelligence
  - Low: simple heuristics
  - High: learns from player
- Dynamic difficulty
  - Must hold interest
  - "Simple to learn, difficult to master is the holy grail of game design"
  - Cheating AI (e.g., racing)

Video Games: Good (Serious Games)

- Simulations for training
  - Flight simulations, combat, medical training
- Games w/a Purpose
  - A game to do useful stuff, hard for computers
  - Luis von Ahn: OWAP
    - OCR: Optical Character Recognition
    - Word OCR: Optical Word Recognition
    - Popvideo: label video
    - Matchin: Pick best images

Video Games: Bad (RSI, addiction)

- Gamer's Thumb
  - Caused with too much use of gamepad
  - Solutions?
    - Break timers, rest
- Video game addiction
  - Impulse control disorder
  - Stanford: yes, addictive!
  - "Gamers Wife"
  - Online gamers anon

Video Games: Ugly (Violence)

- Violent video games
  - Increase aggression, decrease "helping"
  - Others found no link
- High-profile incidents
  - Columbine kids loved the Doom video game
- Ratings help
- Games "folk devil"
  - Billions $, kids at stake

Conclusion: Future of Video Games

- Media producers connecting assets
  - Disney, Lucas big players
- Controllers and sensors expand
- Games on Demand
  - Steam, OnLive
- Brain-Computer Interface (BCI)
  - Invasive and Non-

History of Video Games: 1970s

- Golden age of video arcades
  - Pong, Space Invaders, Asteroids, Pac Man
- 1st gen consoles (1972–1976)
  - Magnavox Odyssey
- Mainframe computers
  - Hunt the Wumpus, Rogue
- Home computers
  - Type the program in
  - Rapples, Tapes. Zork, others
  - Atari 2600, Intellivision, ColecoVision, Activision

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Wikipedia links:
- Artificial Intelligence: [Artificial Intelligence](https://en.wikipedia.org/wiki/Artificial_intelligence)
- Dynamic Game Difficulty Balancing: [Dynamic Game Difficulty Balancing](https://en.wikipedia.org/wiki/Dynamic_game_difficulty_balancing)
- Game Artificial Intelligence: [Game Artificial Intelligence](https://en.wikipedia.org/wiki/Game_artificial_intelligence)
- Video Game Addiction: [Video Game Addiction](https://en.wikipedia.org/wiki/Video_game_addiction)
- Serious Games: [Serious Games](https://en.wikipedia.org/wiki/Serious_games)
- Video Game Controversy: [Video Game Controversy](https://en.wikipedia.org/wiki/Video_game_controversy)
- History of Video Games: 1970s: [History of Video Games](https://www.thegameconsole.com)
History of Video Games: 1980s
- Genre innovation
- Gaming computers
  - Apple II, Commodore 64, Atari 800
- Early online gaming
  - Mostly text-only, MUDs
- Handheld LCD games
- Video game crash of 1983
  - Atari buried millions of ETPs in dump
  - Nintendo Ent. System (NES)
    - Super Mario Bros, Zelda, FF I
  - Gamepad introduced

History of Video Games: 1990s
- Decline of arcades
- Handhelds come of age
  - GameBoy, Sega Game Gear
- Mobile phone gaming
- Fourth generation consoles
  - Sega Genesis, Super NES
- Fifth generation consoles
  - PlayStation, Nintendo 64
- Transition to 3D, CDs
  - Crash Bandicoot, Tomb Raider

History of Video Games: 2000s
- Mobile games
  - iPhone (games 1½ apps)
- Sixth generation consoles
  - PlayStation 2, Xbox, GameCube
- Return of alternate controllers
  - DDR, guitars
- Online gaming rises to prominence
  - WoW, Ultima Online
- Rise of casual PC games
  - Bejeweled, The Sims

History of Video Games: 2005+
- Seventh generation consoles
  - Since 2005
  - Portables
    - Nintendo DS, PSP, iPhone
  - Consoles
    - PS3, Xbox 360, Wii
  - Increases in development budgets
  - Motion control
    - Revolutionizes play
    - Wii controller, iPhone

Example: Playstation 3 Hardware
- State-of-the-art system
  - But SW determines success!
    - (also, cool controllers helps)
- 9 3.2GHz Cores (1PPE, 8SPE)
  - Power Processing Element (PPE)
    - Supervises activities, allocates work
  - Synergistic Processing Element (SPE)
    - Where work gets done
      - During testing, one "locked out"
        - i.e., it didn’t work, shut down
        - … even if everything DID work!

en.wikipedia.org/wiki/PlayStation_3
www.us.playstation.com