

CS10
The Beauty and Joy of Computing
Lecture #3 : Video Games
2012-06-20



UC Berkeley
Computer Science
Summer Instructor
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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>

www.theesa.com/facts

Size of the US video game market?

entertainment software association

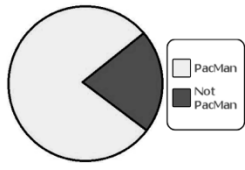
- \$250,000,000
- \$2,500,000,000
- \$25,000,000,000
- \$250,000,000,000
- \$2,500,000,000,000

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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**

PacMan Statistics



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Documentaries on Video Games

- **History: Video Games: Behind the Fun (2000)**
 - Available on Netflix
- **PBS: The Video Game Revolution (2004)**
 - video.google.com/videoplay?docid=-4729348985218842392
- **Discovery: History of Video Games (2006)**
 - video.google.com/videoplay?docid=3637639460474263178
- **ON Networks : Play Value (2009)**
 - www.onnetworks.com/videos/play-value
- **History of Video Games (WWW)**
 - en.wikipedia.org/wiki/History_of_video_games

en.wikipedia.org/wiki/
List_of_films_based_on_video_games#
Documentaries_on_video_games

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The Beginning : Spacewar!

- **First to gain recognition**
 - Others had games before
 - "Conceived in 1961 by Martin Graetz, Steve Russell, & Wayne Wiitanen"
 - Written for PDP-1 @ MIT
 - Inspired lots, widely ported
- **Can still play this!**
 - 1 Working PDP-1 ... in CHM
 - Java version available







www3.sympatico.ca/maury/games/space/spacewar.html
en.wikipedia.org/wiki/Spacewar!
www.computerhistory.org
spacewar.oversigma.com

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The Founding Fathers

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

www.onnetworks.com/videos/play-value/the-founding-fathers
(also on iTunes in HD 720p)

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Shigeru Miyamoto

- The “Walt Disney” of video games

- Chief Game designer at Nintendo
- 1st elected to Hall of Fame

- Designed (among others):

- Donkey Kong
- Super Mario Bros
- The Legend of Zelda
- Super Mario 64
- Nintendo DS, Wii



www.onnetworks.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



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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!



www.apple.com/iphone/apps-for-everything/fun-and-games.html
blog.entertainment.com/2009/07/7-addicting-casual-games
en.wikipedia.org/wiki/Casual_game



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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



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www.theesa.com/facts/gameplayer.asp

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



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



entertainment software association



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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!



www.nytimes.com/2009/07/08/arts/television/08fight.html
en.wikipedia.org/wiki/Portal:Computer_graphics
www.siggraph.org



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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” feet
- UC Berkeley Research!



en.wikipedia.org/wiki/Motion_capture
www.phasespace.com

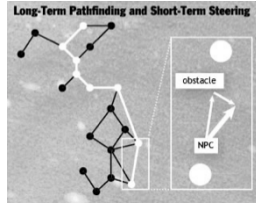


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How : Artificial Intelligence

- **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)



www.businessweek.com/innovate/content/aug2008/id20080820_123140.htm
en.wikipedia.org/wiki/Dynamic_game_difficulty_balancing
en.wikipedia.org/wiki/Game_artificial_intelligence
queue.acm.org/detail.cfm?id=971593

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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: GWAP
 - ESP : Label images fastest
 - Gender Guesser
 - Popvideo : label video
 - Matchin : Pick best images



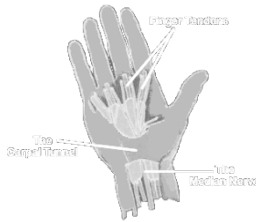
en.wikipedia.org/wiki/Serious_games
en.wikipedia.org/wiki/Game_based_learning
gwap.com

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Video Games : Bad (RSI, addiction)

- **Gamers 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



en.wikipedia.org/wiki/Video_game_addiction
en.wikipedia.org/wiki/Repetitive_strain_injury

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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



en.wikipedia.org/wiki/Video_game_controversy
www.apa.org/science/psa/sb-anderson.html

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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-



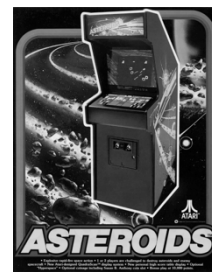
www.pbs.org/kcts/videogameevolution/impact/future.html
en.wikipedia.org/wiki/Brain-computer_interface

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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!
 - Floppies, Tapes, Zork, others.
- **2nd gen consoles (1977-1984)**
 - Atari 2600, Intellivision, Colecovision, Activision



en.wikipedia.org/wiki/History_of_video_games
www.thegameconsole.com

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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 ETs in dump
- **3rd gen consoles (1985–1989)**
 - Nintendo Ent. System (NES)
 - Super Mario Bros, Zelda, FF I
 - Gamepad introduced



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History of Video Games : 1990s

- **Decline of arcades**
- **Handhelds come of age**
 - GameBoy, Sega Game Gear
- **Mobile phone gaming**
- **Fourth generation consoles (1990–1994)**
 - Sega Genesis, Super NES
- **Fifth generation consoles (1995–2000)**
 - Playstation, Nintendo 64 (with Super Mario 64)
- **Transition to 3D, CDs**
 - Crash Bandicoot, Tomb Raider



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History of Video Games : 2000s

- **Mobile games**
 - iPhone (games ½ apps)
- **Sixth generation consoles (since 2001)**
 - PS2, Xbox, GameCube
 - Return of alternate controllers (DDR, guitars)
- **Online gaming rises to prominence**
 - WoW, Ultima Online
- **Rise of casual PC games**
 - Bejeweled, The Sims



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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



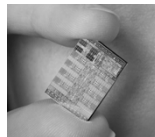
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Example: Playstation 3 Hardware

- **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 Elt (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

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