



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>

Size of the US video game market?

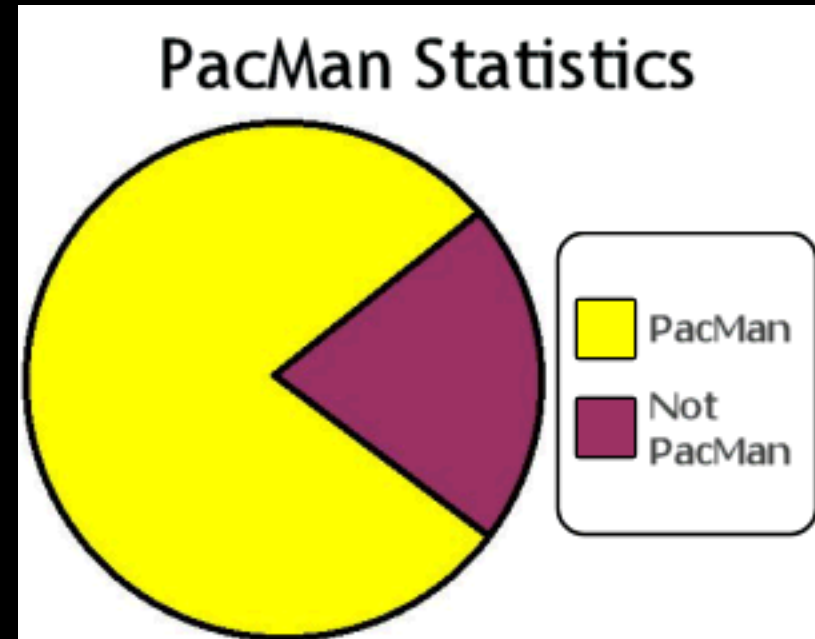


- a) \$250,000,000
- b) \$2,500,000,000
- c) \$25,000,000,000
- d) \$250,000,000,000
- e) \$2,500,000,000,000



Video Games : Overview

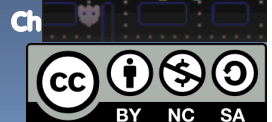
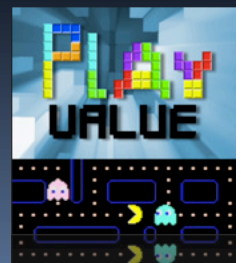
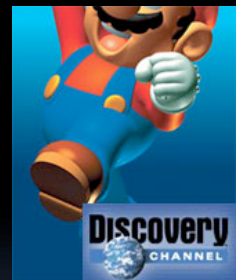
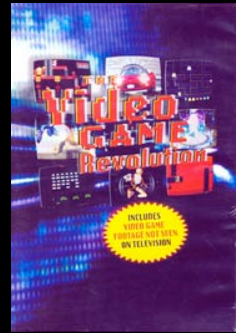
- **History**
 - Inventors & Games
- **How**
 - Design
 - 2D & 3D graphics
 - Motion Capture
 - Artificial Intelligence (AI)
- **Good, Bad, Ugly**
 - GWAP, RSI, Violence
- **Future**



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](http://en.wikipedia.org/wiki/List_of_films_based_on_video_games#Documentaries_on_video_games)



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

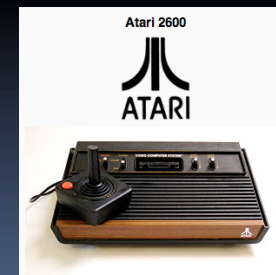
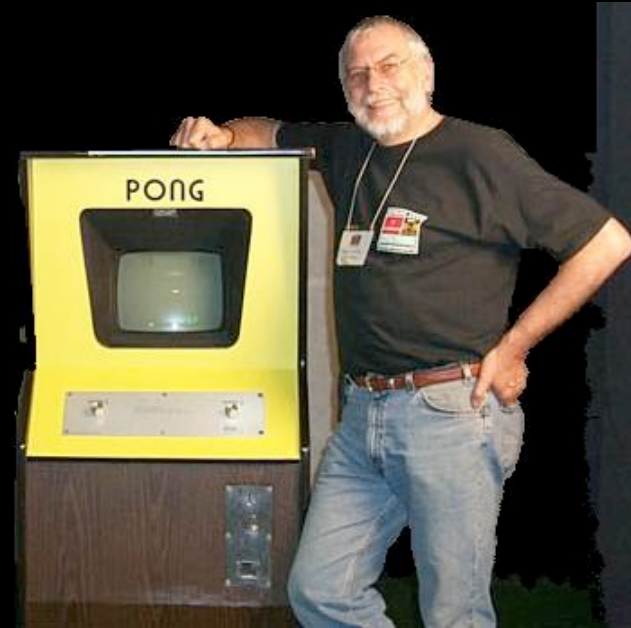


The Founding Fathers

- Ralph Baer



- Nolan Bushnell

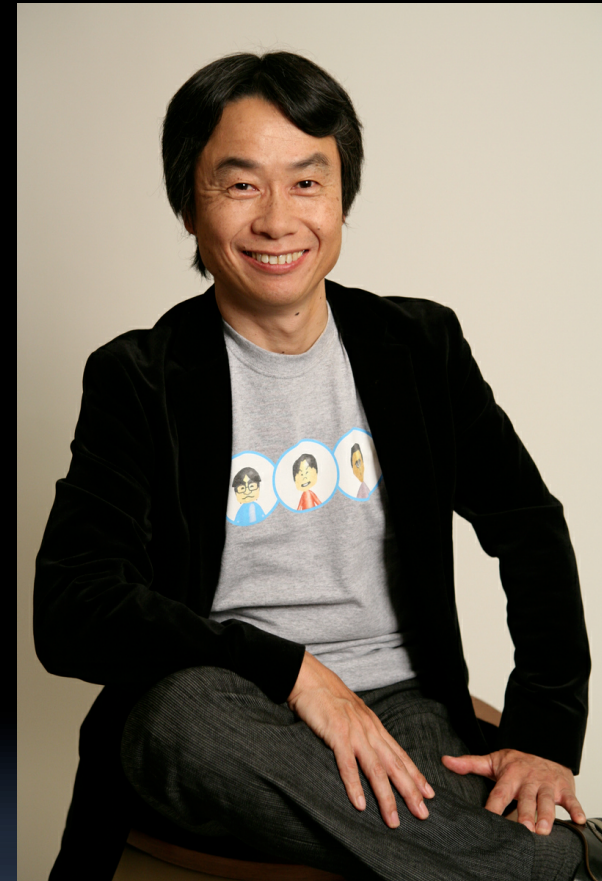


www.onnetworks.com/videos/play-value/the-founding-fathers
(also on iTunes in HD 720p)



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



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!

ANGRY BIRDS

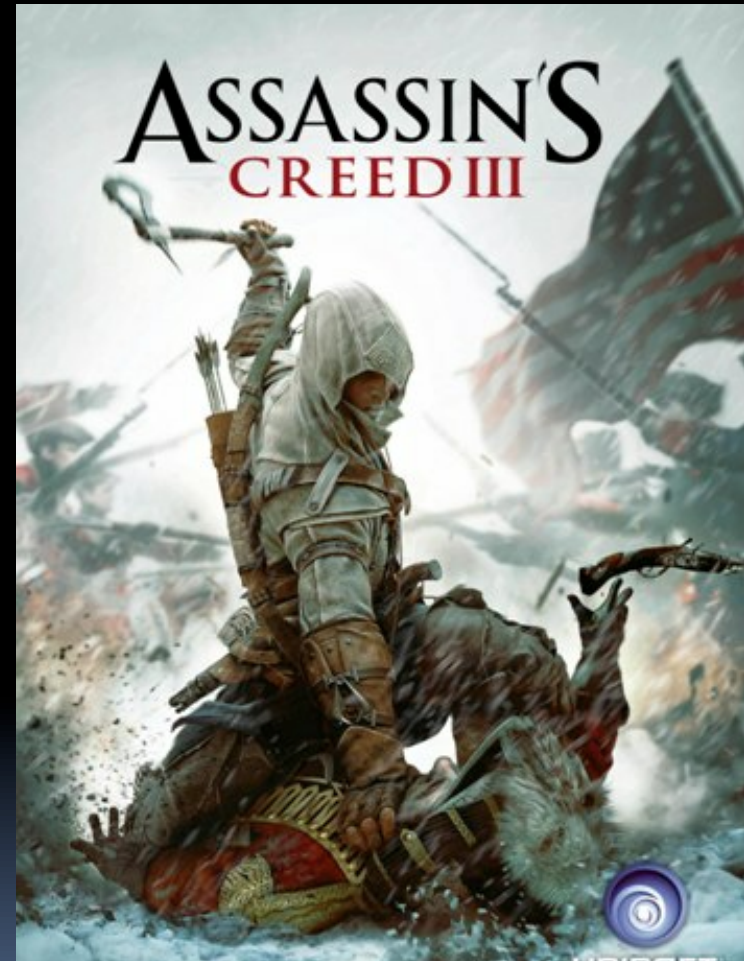


www.apple.com/iphone/apps-for-everything/fun-and-games.html
blog.entertainment.com/2009/07/7-addicting-casual-games
en.wikipedia.org/wiki/Casual_game



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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% of Parents : "Video games are a positive part of my child's life"



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



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

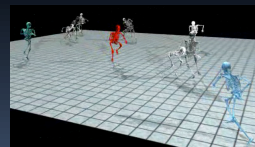
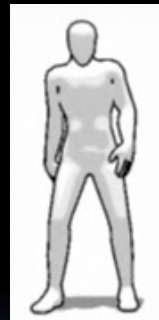
en.wikipedia.org/wiki/Portal:Computer_graphics

www.siggraph.org



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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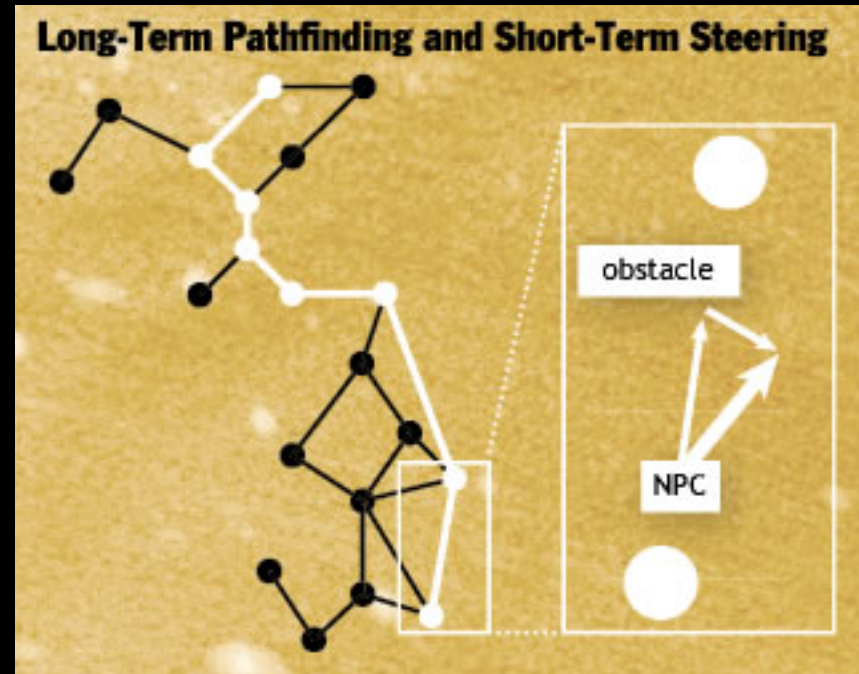


Chun, Summer 2012



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



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

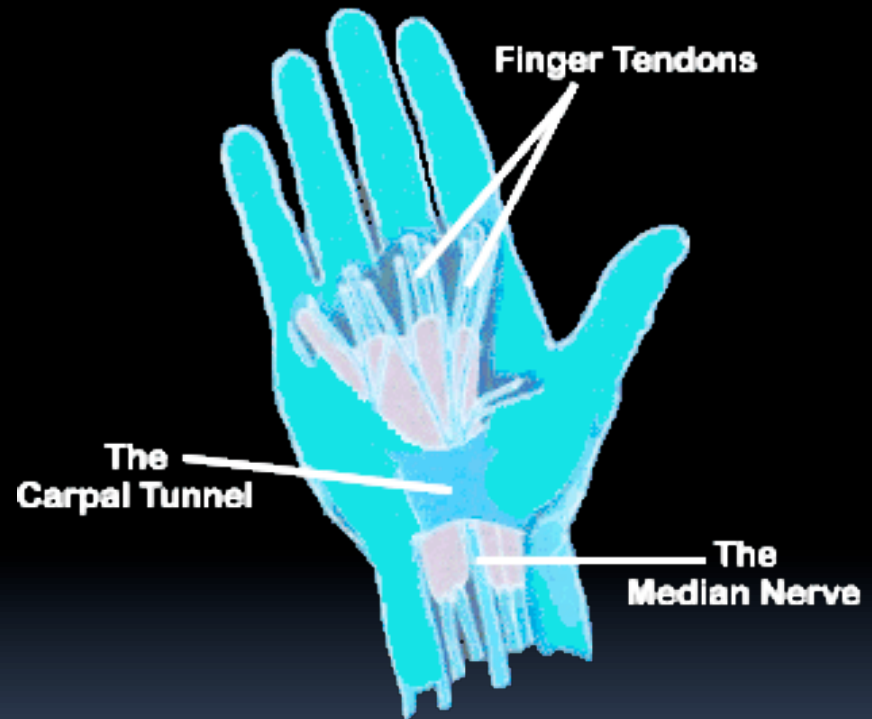


en.wikipedia.org/wiki/Serious_games
en.wikipedia.org/wiki/Game_based_learning
gwap.com



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

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



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/videogamerevolution/impact/future.html
en.wikipedia.org/wiki/Brain-computer_interface



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



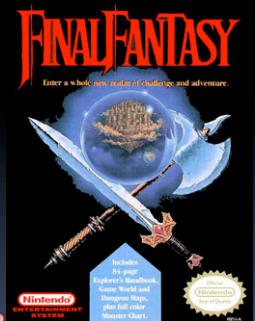
en.wikipedia.org/wiki/History_of_video_games

www.thegameconsole.com



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



THE LEGEND OF
ZELDA



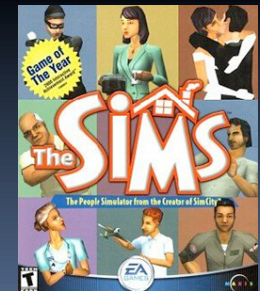
History of Video Games : 1990s

- 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



History of Video Games : 2000s

- **Mobile games**
 - iPhone (games 1/2 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



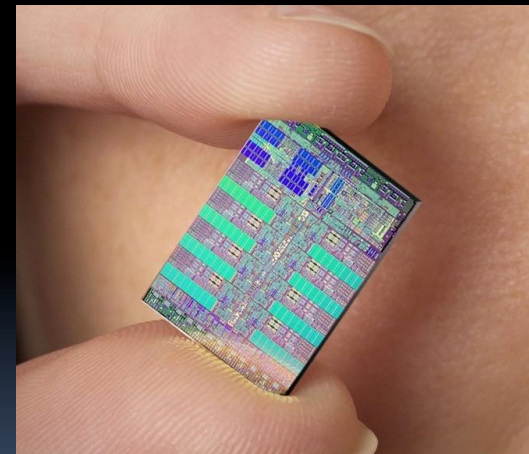
History of Video Games : 2005+

- **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

