CS10
The Beauty and Joy of Computing

Lecture #3 : Video Games

2012-01-25

UC Berkeley EECS
Lecturer SOE
Dan Garcia

UC Berkeley EECS
Head TA
Glenn Sugden

CONTROL GAMES WITH THOUGHT!

The Emotiv Epoc sells for $300 and it comes with an app called EmoKey which allows you to "think" an action and the key will be clicked in the game or program, so you can control anything. (even powerpoint slides?) ☺

emotiv.com

How big is US video game market?

a) $250,000,000

b) $2,500,000,000

c) $25,000,000,000

d) $250,000,000,000
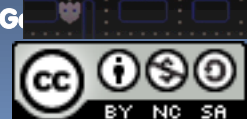
e) $2,500,000,000,000
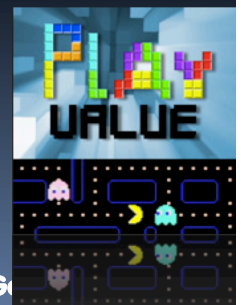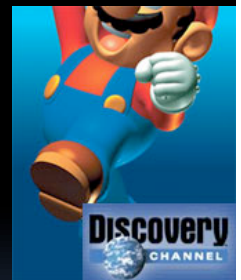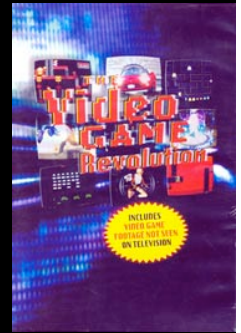
Video Games : Overview

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

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=-472934898521884 2392

- **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
```

The Beginning : Spacewar!

- **First to gain recognition**
  - Others had games before
  - "Conceived in 1961 by Martin Graetz, **Stephen 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

WEDGE SHIP

CENTRAL STAR

STARFIELD (HARD TO SEE AT SUCH A LOW RESOLUTION)

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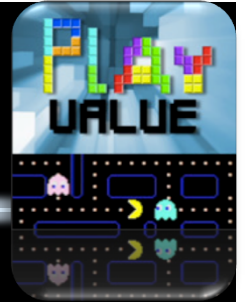
`www3.sympatico.ca/maury/games/space/spacewar.html`
`en.wikipedia.org/wiki/Spacewar!`
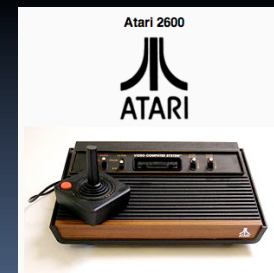`www.computerhistory.org`
`spacewar.oversigma.com`

The Founding Fathers

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

ODYSSEY

Atari 2600
ATARI

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

Shigeru Miyamoto

- **The "Walt Disney" of computing gaming**
  - 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.time.com/time/asia/2006/heroes/bl_miyamoto.html
en.wikipedia.org/wiki/Shigeru_Miyamoto

Design of a *Casual* Video Game

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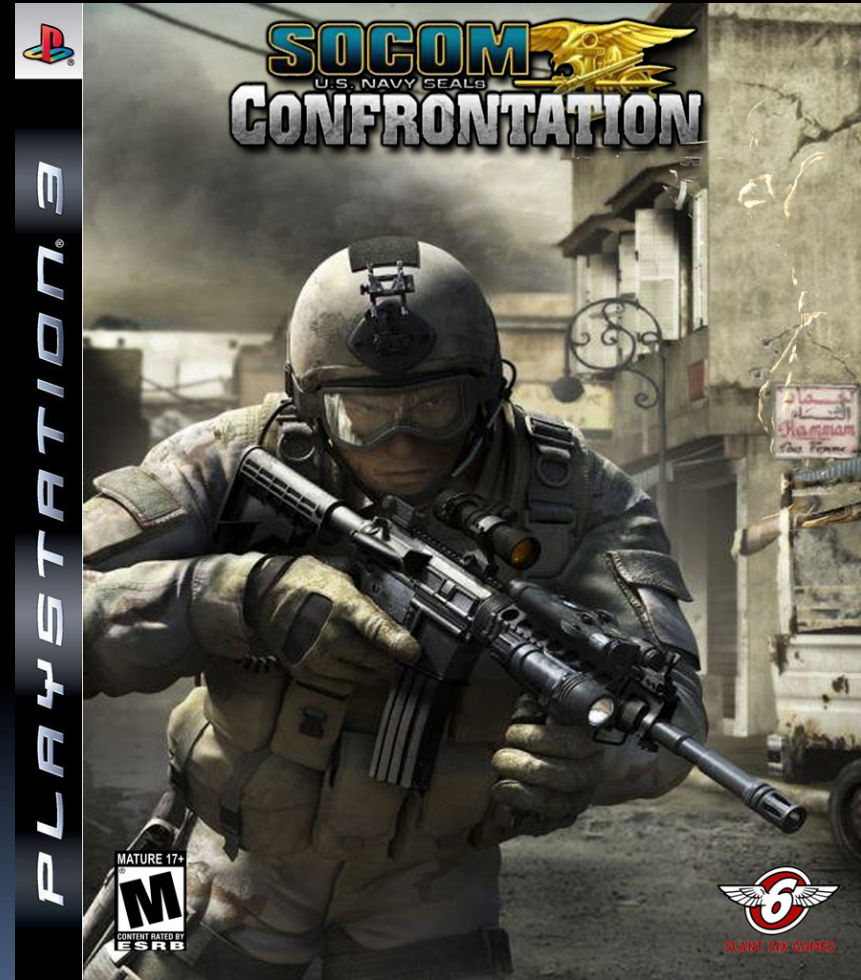 - Often only a few months!

www.apple.com/iphone/apps-for-everything/fun-and-games.html
blog.entertonement.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

% of Parents "Games provide mental stimulation or education"

a) **38%**

b) **48%**

c) **58%**

d) **68%**

e) **78%**

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!

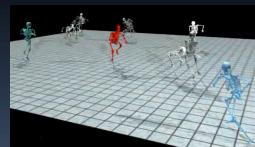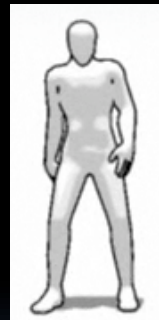www.nytimes.com/2009/07/08/arts/television/08fight.html
en.wikipedia.org/wiki/Portal:Computer_graphics
www.siggraph.org

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!

UC Berkeley CS10 "The Beauty and Joy of Computing" : Video Games (13)
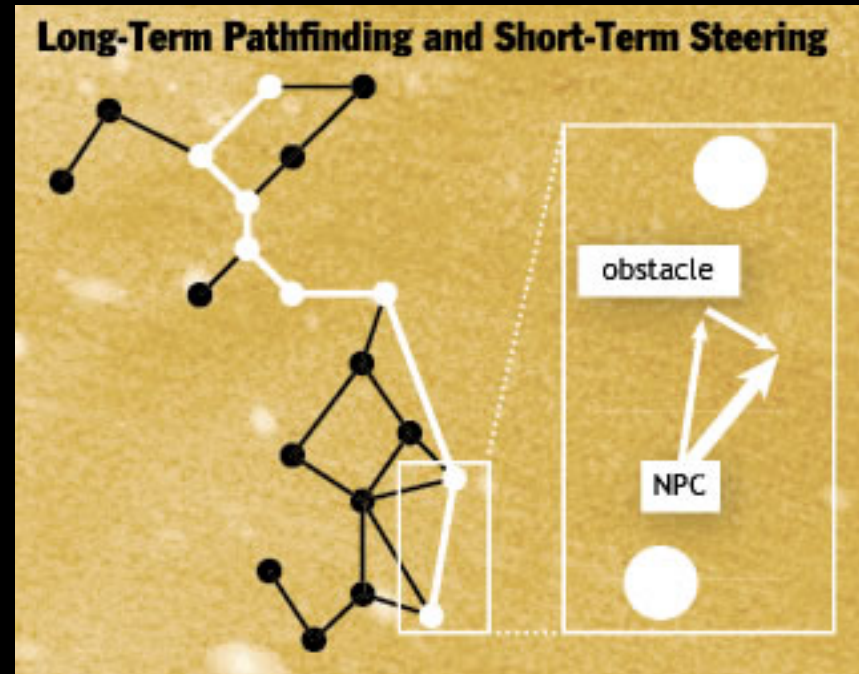
How : Artificial Intelligence

- **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)

Long-Term Pathfinding and Short-Term Steering

obstacle

NPC

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
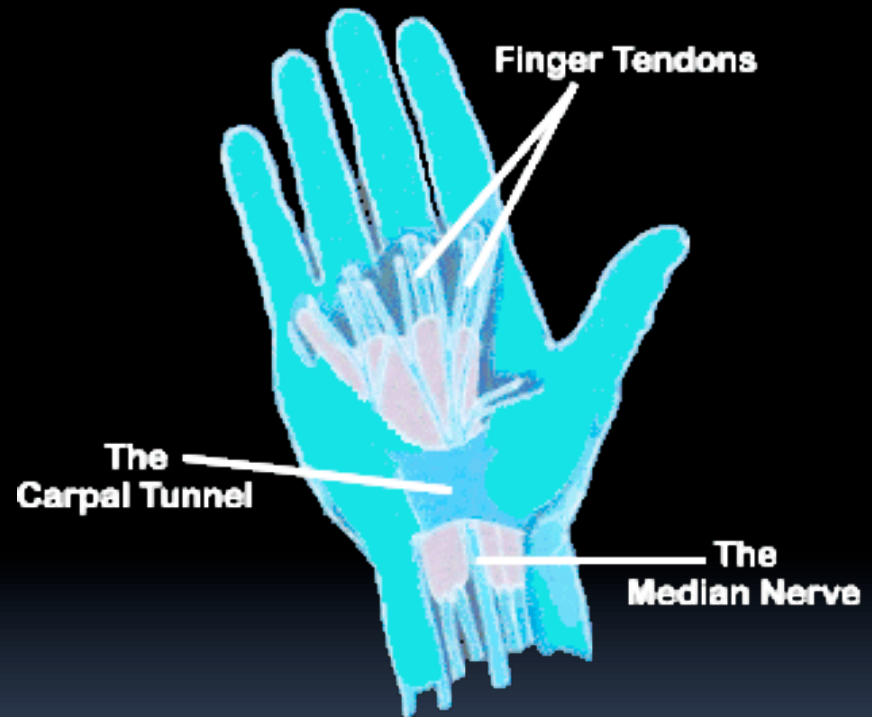   - Popvideo : label video
    - Matchin : Pick best images

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
  - I suffered this in 1980s!
  - Solutions?
    - Break timers, rest
- **Video game addiction**
  - Impulse control disorder
  - Stanford: yes, addictive!
  - "Gamers Wife"
  - Online gamers anon

Finger Tendons

The Carpal Tunnel

The Median Nerve

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

Glenn Sugden : *My Story*

- **Started game development in 1991**
  - Worked until 1999 for Presage
  - Design and developed games for LucasArts, Interplay, Sierra Dynamics, Brødurbund,
    - The Incredible Machine for mac
    - Quake 2 for mac

- **Started own game development company…**

Conclusion : Future of Video Games

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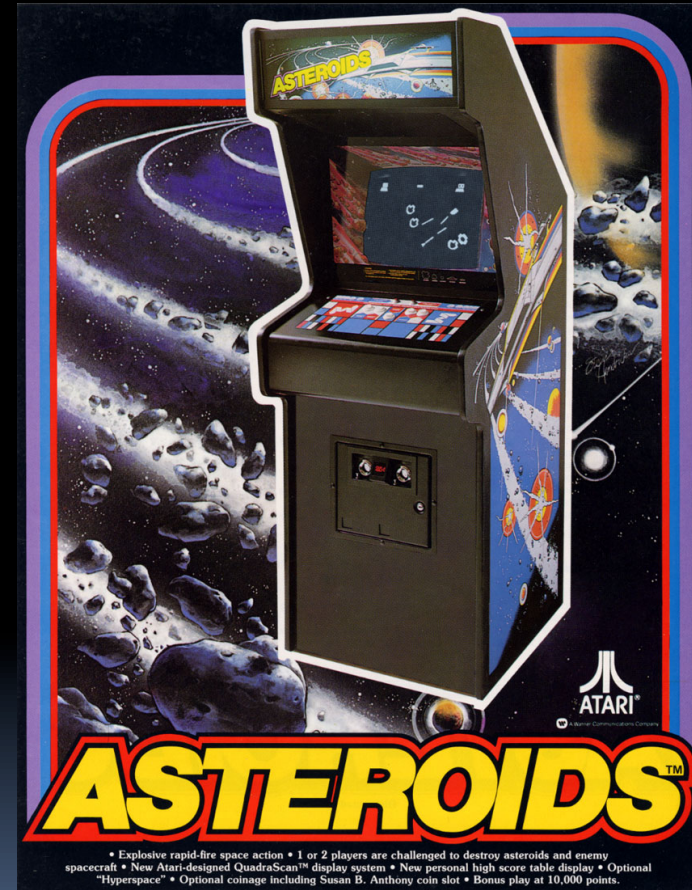- **Brain-Computer Interface (BCI)**
    - Invasive and Non-

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

ASTEROIDS

• Explosive rapid-fire space action • 1 or 2 players are challenged to destroy asteroids and enemy spacecraft • New Atari-designed QuadraScan™ display system • New personal high score table display • Optional "Hyperspace" • Optional coinage including Susan B. Anthony coin slot • Bonus play at 10,000 points.
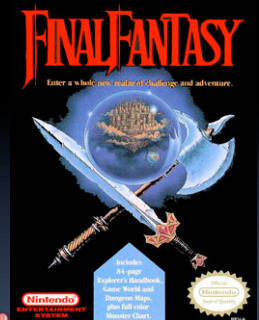
History of Video Games : 1980s

- **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
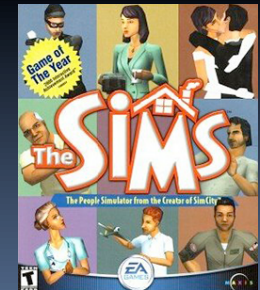   - Gamepad introduced

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 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**
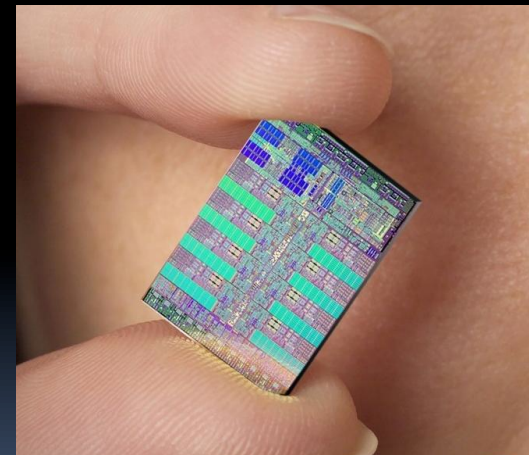 - Bejeweled, The Sims

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 Elt (PPE)
    - Supervises activities, allocates work
  - Synergystic 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