# CS39N
# The Beauty and Joy of Computing

## Lecture #2 : Video Games

### 2009-08-31

**UC Berkeley
Computer Science
Lecturer SOE
Dan Garcia**

## VENEZUELA BANS VIOLENT GAMES

In an effort to curb rampant crime, Venezuelan lawmakers have put forth a bill to ban violent video games and toys.

Violent Games

Are Bad.

# 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=-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
```
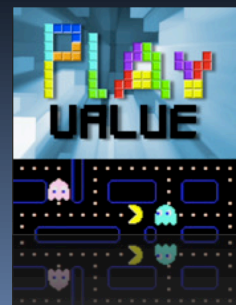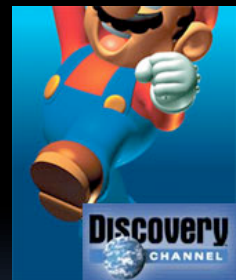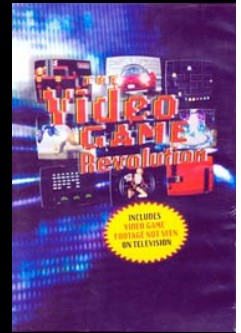
# The Beginning : Spacewar!

- **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!`
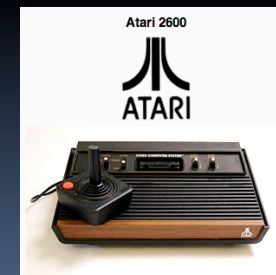`www.computerhistory.org`
`spacewar.oversigma.com`

# The Founding Fathers

- ## Ralph Baer

- ## Nolan Bushnell
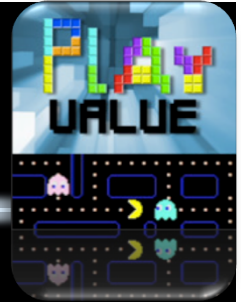
ODYSSEY

Atari 2600

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

# History of Video Games : 1970s

- **Golden age of video arcades**
  - Pong, Space Invaders, Asteroids, Pac Man

- **1<sup>st</sup> gen consoles (1972–1976)**
  - Magnavox Odyssey

- **Mainframe computers**
  - Hunt the Wumpus, Rogue

- **Home computers**
  - Type the program in!
  - Floppies, Tapes. Zork, others.

- **2<sup>nd</sup> gen consoles (1977–1984)**
  - Atari 2600, Intellivision, Colecovision, Activision
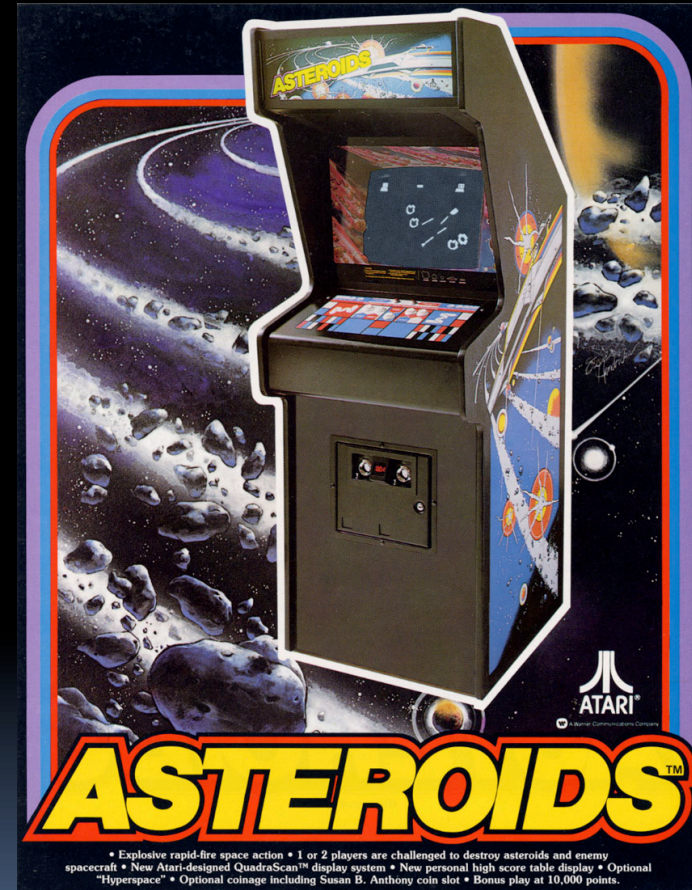
en.wikipedia.org/wiki/History_of_video_games

www.thegameconsole.com

Garcia, Fall 2009

# 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
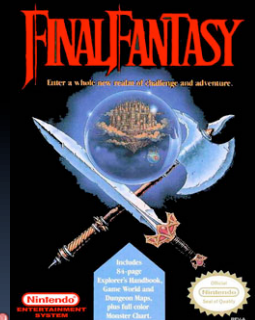
# History of Video Games : 1990s

- **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
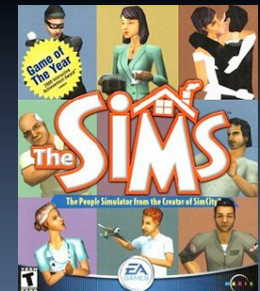
# History of Video Games : 2005+

- **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
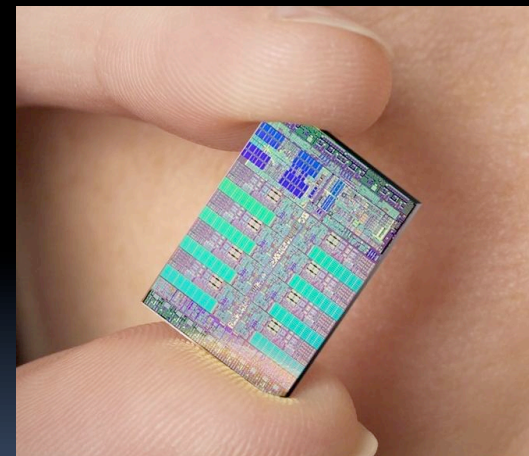




en.wikipedia.org/wiki/PlayStation_3
www.us.playstation.com

# 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
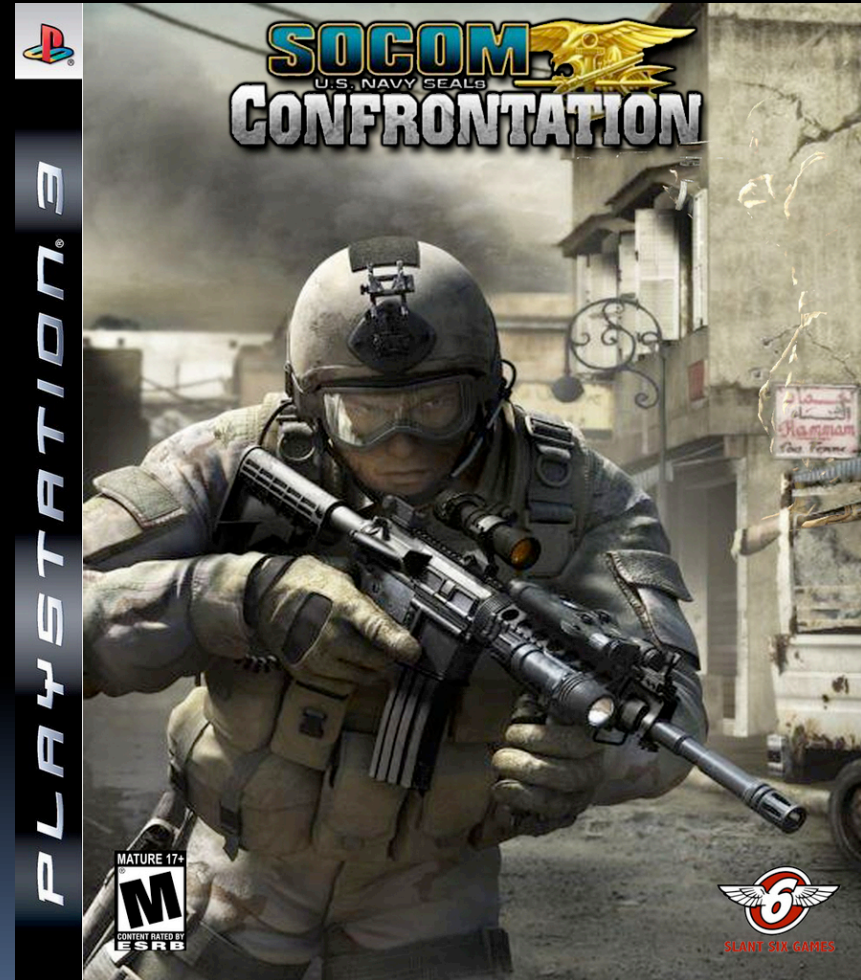
# How : 3D Computer Graphics

- **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!
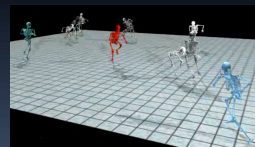


en.wikipedia.org/wiki/Motion_capture
www.phasespace.com
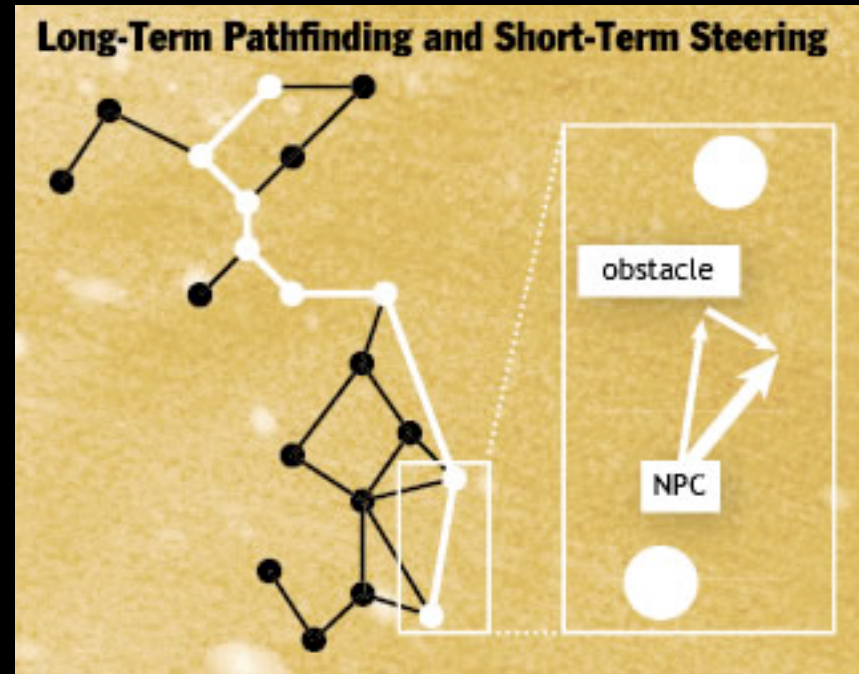
# How : Artificial Intelligence

- **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
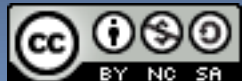
# Video Games : Bad (RSI, addiction)

- ***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
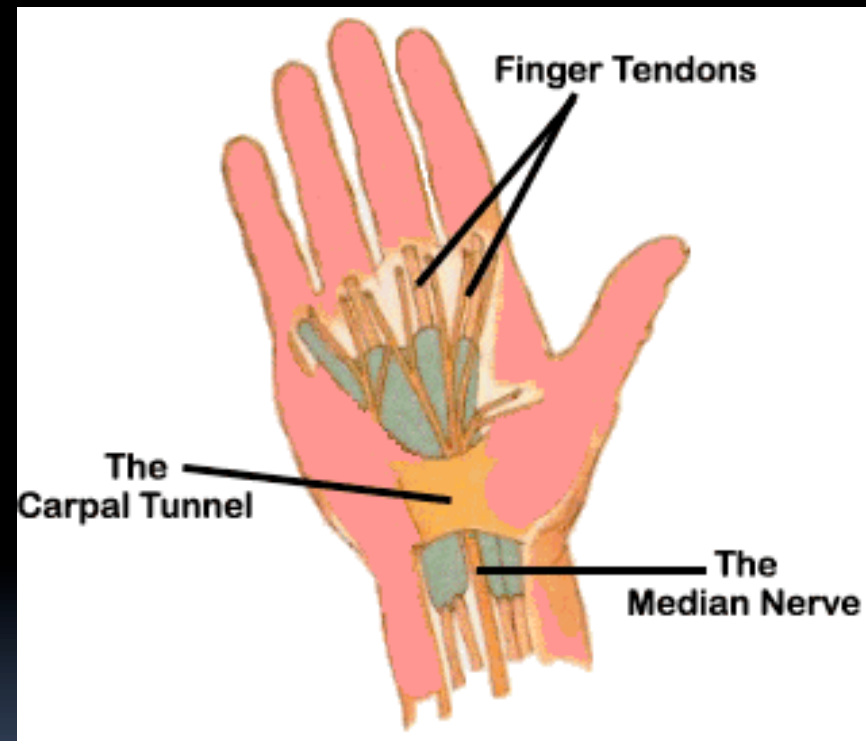
en.wikipedia.org/wiki/Video_game_addiction
en.wikipedia.org/wiki/Repetitive_strain_injury
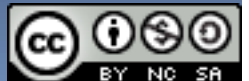
# Video Games : Ugly (Violence)

- **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

# 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