

# VIDEO GAMES

The Beauty and Joy of Computing/CS Principles



UC Berkeley EECS  
Lecturer SOE  
Dan Garcia



UC Berkeley EECS  
TA-in-Training  
Glenn Sugden

# GAMIFICATION OF BUSINESS!

Channeling the “gamer addiction” to earn virtual points, companies are now adding badges and rewards to things.

E.g., Nike + (exercise game), Mint.com (encouraging savings), Foursquare (location-based social network), etc...



# How big is US video game market?

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- a) \$100,000,000
- b) \$1,000,000,000
- c) \$10,000,000,000
- d) \$100,000,000,000
- e) \$1,000,000,000,000



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# Video Games : Overview

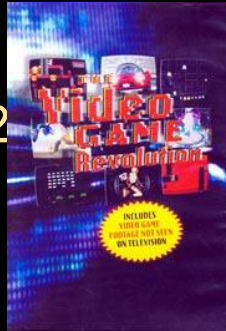
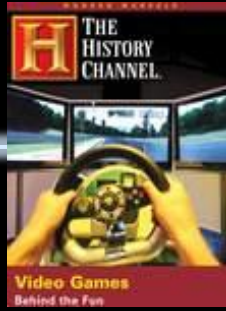
- History
  - Inventors & Games
- How
  - Design
  - 2D & 3D graphics
  - Motion Capture
  - Artificial Intelligence (AI)
- Good, Bad, Ugly
  - GWAP, RSI, Violence
- Future



# 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](https://video.google.com/videoplay?docid=-4729348985218842392)
- Discovery: History of Video Games (2006)
  - [video.google.com/videoplay?docid=3637639460474263178](https://video.google.com/videoplay?docid=3637639460474263178)
- ON Networks : Play Value (2009)
  - [www.onnetworks.com/videos/play-value](http://www.onnetworks.com/videos/play-value)
- History of Video Games (WWW)
  - [en.wikipedia.org/wiki/History\\_of\\_video\\_games](http://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, **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



[www3.sympatico.ca/maury/games/space/spacewar.html](http://www3.sympatico.ca/maury/games/space/spacewar.html)

[en.wikipedia.org/wiki/Spacewar!](http://en.wikipedia.org/wiki/Spacewar!)

[www.computerhistory.org](http://www.computerhistory.org)

[spacewar.oversigma.com](http://spacewar.oversigma.com)

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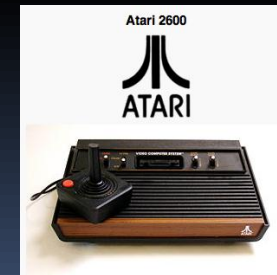
# The Founding Fathers



- Ralph Baer



- Nolan Bushnell



[www.onnetworks.com/videos/play-value/the-founding-fathers](http://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 computing gaming
  - Chief Game designer at Nintendo
  - 1<sup>st</sup> 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](http://www.onnetworks.com/videos/play-value/shigeru-miyamoto)  
[www.time.com/time/asia/2006/heroes/bl\\_miyamoto.html](http://www.time.com/time/asia/2006/heroes/bl_miyamoto.html)  
[en.wikipedia.org/wiki/Shigeru\\_Miyamoto](http://en.wikipedia.org/wiki/Shigeru_Miyamoto)

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# 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



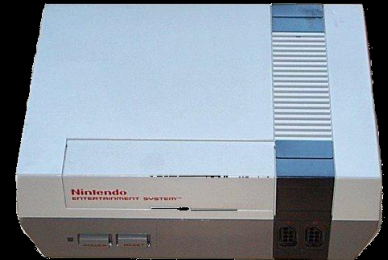
[en.wikipedia.org/wiki/History\\_of\\_video\\_games](https://en.wikipedia.org/wiki/History_of_video_games)  
[www.thegameconsole.com](http://www.thegameconsole.com)

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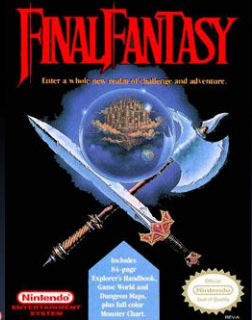


# History of Video Games : 1980s

- 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
- 3<sup>rd</sup> gen consoles (1985–1989)
  - Nintendo Ent. System (NES)
    - Super Mario Bros, Zelda, FF I
    - Gamepad introduced



THE LEGEND OF  
**ZELDA**





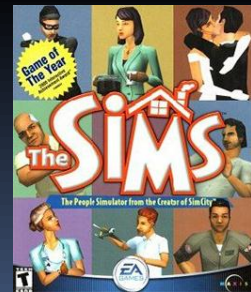
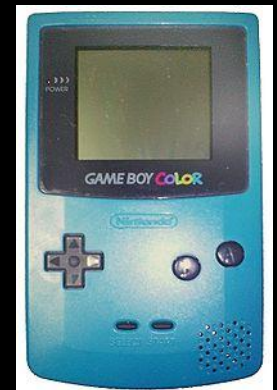
# History of Video Games : 1990s

- 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 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



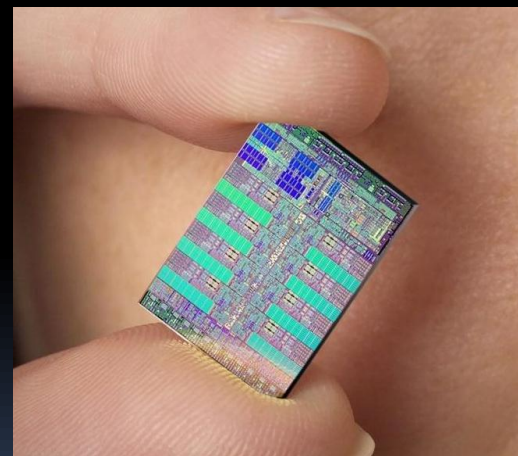
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# Example: Playstation 3 Hardware

- State-of-the-art system
  - But SW determines success!
  - (also, cool controllers helps)
- 9 3.2GHz Cores (1PPE, 8SPE)
  - Power Processing Elt (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



[en.wikipedia.org/wiki/PlayStation\\_3](http://en.wikipedia.org/wiki/PlayStation_3)  
[www.us.playstation.com](http://www.us.playstation.com)

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# 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!

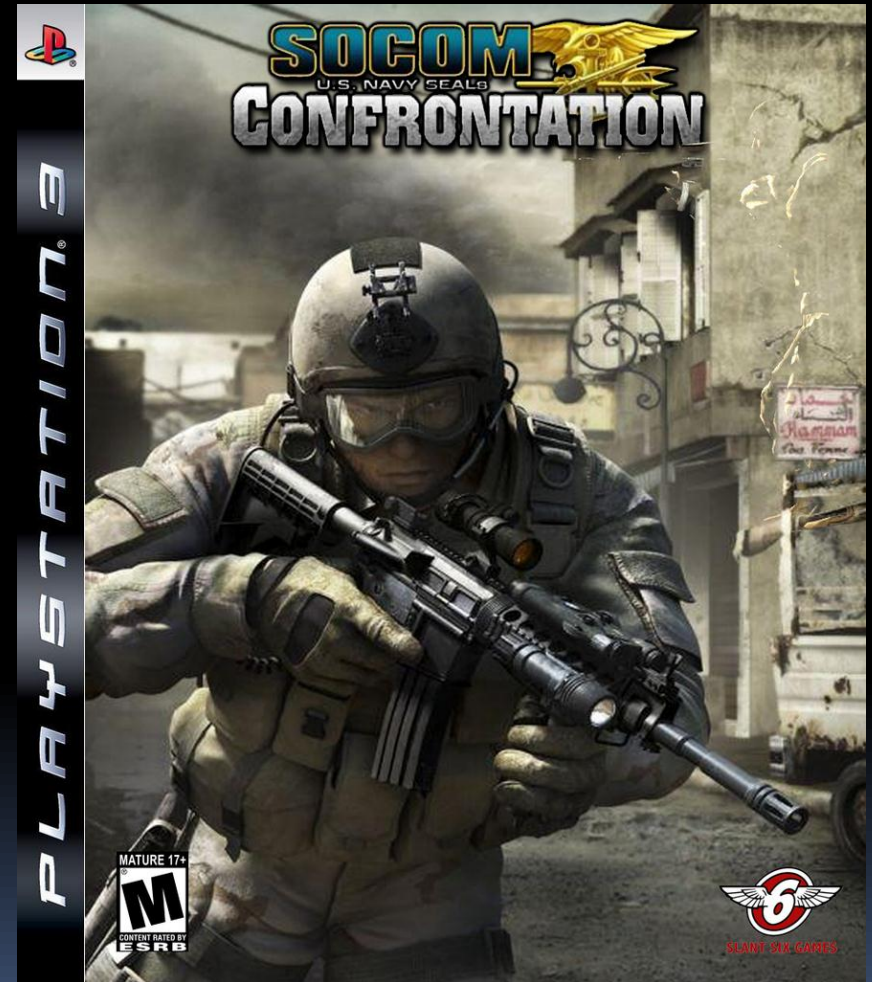


[www.apple.com/iphone/apps-for-everything/fun-and-games.html](http://www.apple.com/iphone/apps-for-everything/fun-and-games.html)  
[blog.entertainment.com/2009/07/7-addicting-casual-games](http://blog.entertainment.com/2009/07/7-addicting-casual-games)  
[en.wikipedia.org/wiki/Casual\\_game](http://en.wikipedia.org/wiki/Casual_game)



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

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# % of Parents “Games positive for kids”

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- a) 34%
- b) 44%
- c) 54%
- d) 64%
- e) 74%



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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](http://www.nytimes.com/2009/07/08/arts/television/08fight.html)

[en.wikipedia.org/wiki/Portal:Computer\\_graphics](http://en.wikipedia.org/wiki/Portal:Computer_graphics)

[www.siggraph.org](http://www.siggraph.org)

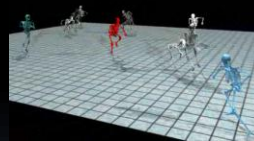
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# How : Motion Capture

- 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!



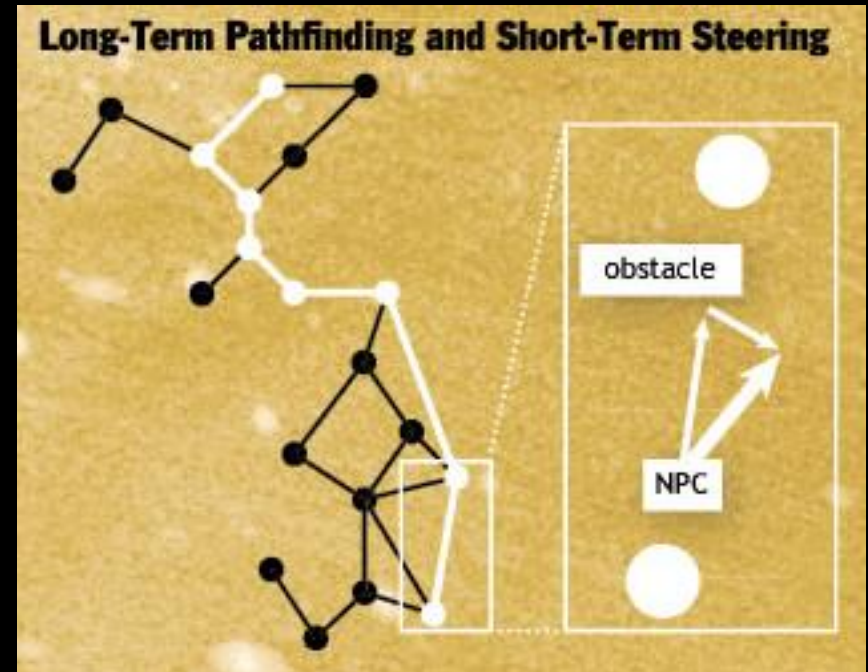
[en.wikipedia.org/wiki/Motion\\_capture](https://en.wikipedia.org/wiki/Motion_capture)  
[www.phasespace.com](http://www.phasespace.com)

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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)



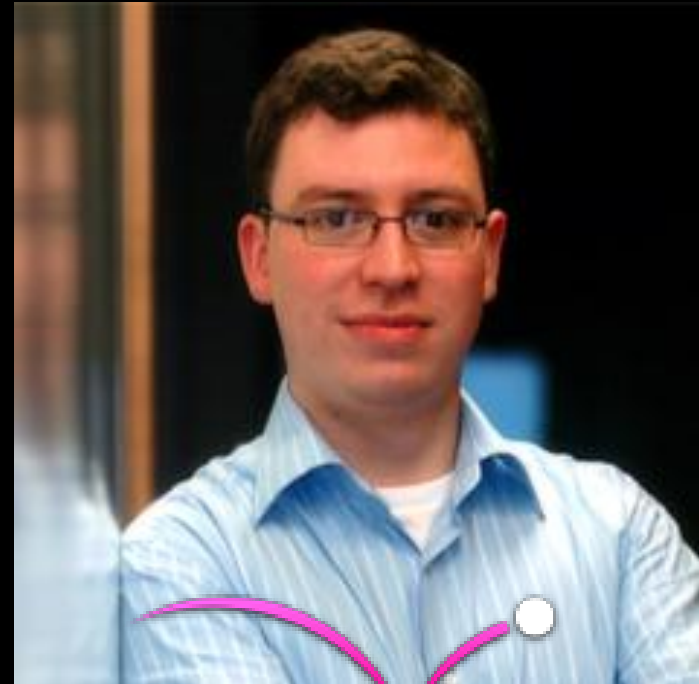
[www.businessweek.com/innovate/content/aug2008/id20080820\\_123140.htm](http://www.businessweek.com/innovate/content/aug2008/id20080820_123140.htm)  
[en.wikipedia.org/wiki/Dynamic\\_game\\_difficulty\\_balancing](http://en.wikipedia.org/wiki/Dynamic_game_difficulty_balancing)  
[en.wikipedia.org/wiki/Game\\_artificial\\_intelligence](http://en.wikipedia.org/wiki/Game_artificial_intelligence)  
[queue.acm.org/detail.cfm?id=971593](http://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



gwap

[en.wikipedia.org/wiki/Serious\\_games](http://en.wikipedia.org/wiki/Serious_games)  
[en.wikipedia.org/wiki/Game\\_based\\_learning](http://en.wikipedia.org/wiki/Game_based_learning)  
[gwap.com](http://gwap.com)

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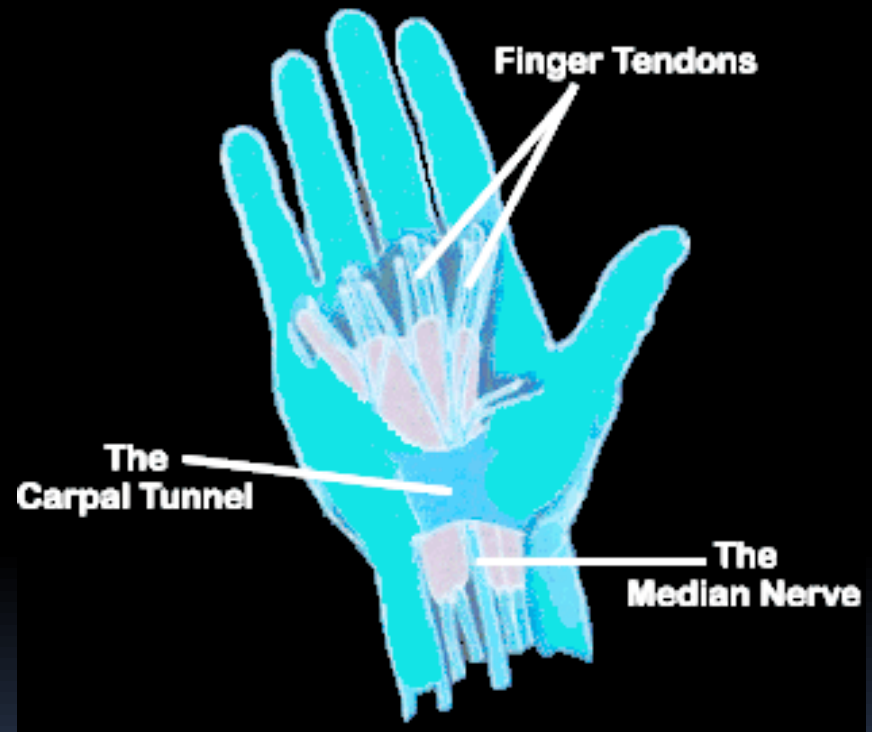
# Video Games : Bad (RSI, addiction)

- *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



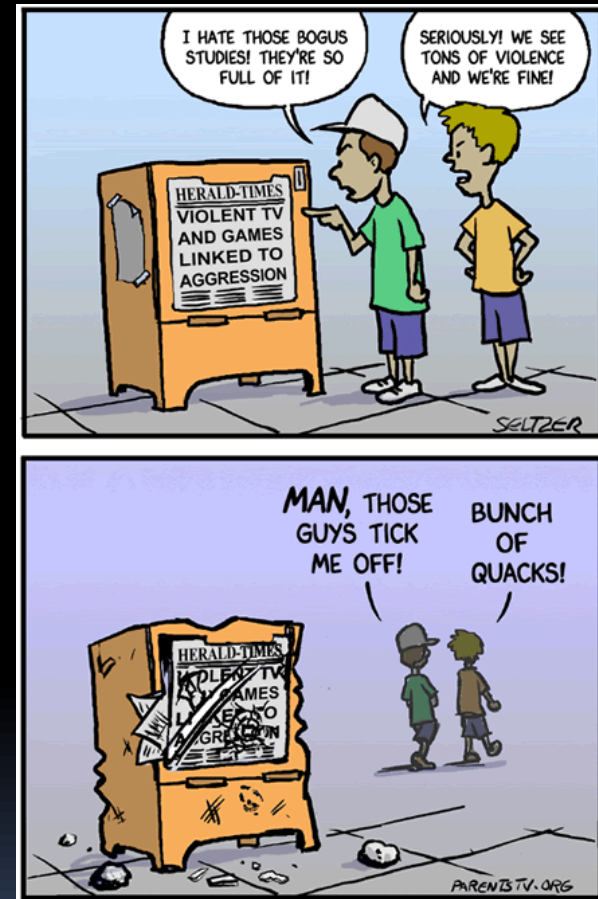
[en.wikipedia.org/wiki/Video\\_game\\_addiction](https://en.wikipedia.org/wiki/Video_game_addiction)  
[en.wikipedia.org/wiki/Repetitive\\_strain\\_injury](https://en.wikipedia.org/wiki/Repetitive_strain_injury)

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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](http://en.wikipedia.org/wiki/Video_game_controversy)  
[www.apa.org/science/psa/sb-anderson.html](http://www.apa.org/science/psa/sb-anderson.html)

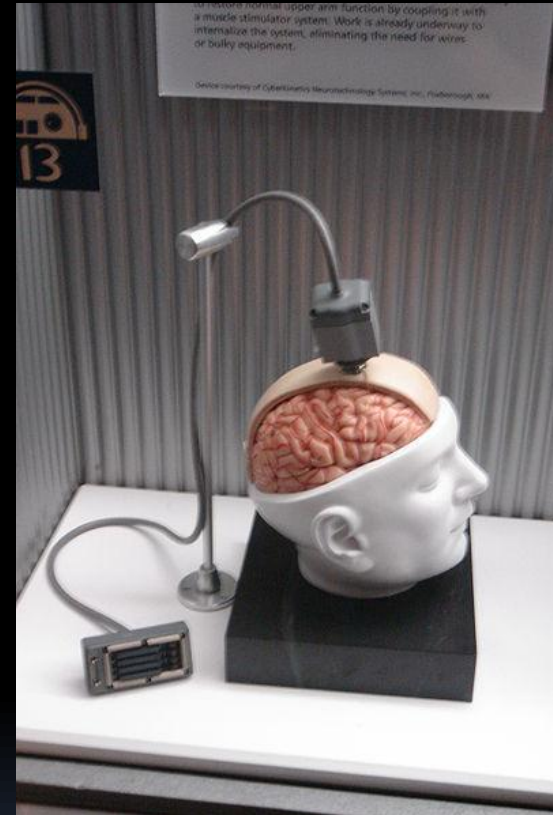
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# Future of Video Games

- 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](http://www.pbs.org/kcts/videogamerevolution/impact/future.html)  
[en.wikipedia.org/wiki/Brain-computer\\_interface](http://en.wikipedia.org/wiki/Brain-computer_interface)

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