



www.theesa.com/facts



## CS10 The Beauty and Joy of Computing

### Lecture #3 : Video Games

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**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...



[tech.fortune.cnn.com/2010/09/03/the-game-based-economy/](http://tech.fortune.cnn.com/2010/09/03/the-game-based-economy/)

## How big is US video game market?


entertainment software association

- \$100,000,000
- \$1,000,000,000
- \$10,000,000,000
- \$100,000,000,000
- \$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**



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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](http://video.google.com/videoplay?docid=-4729348985218842392)
- **Discovery: History of Video Games (2006)**
  - [video.google.com/videoplay?docid=3637639460474263178](http://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

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## 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  
 www.time.com/time/asia/2006/heroes/bl\_miyamoto.html  
 en.wikipedia.org/wiki/Shigeru\_Miyamoto

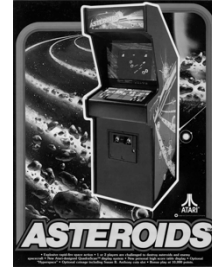
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## History of Video Games : 1970s

- 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, 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
- 3<sup>rd</sup> 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



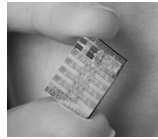
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## Example: Playstation 3 Hardware

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



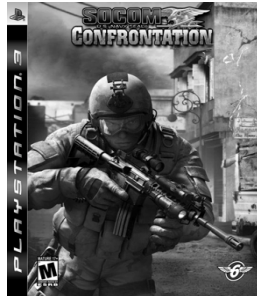
www.apple.com/iphone/apps-for-everything/fun-and-games.html  
blog.entertainment.com/2009/07/7-addicting-casual-games  
en.wikipedia.org/wiki/Casual\_game

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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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## % of Parents "Games positive for kids"

- www.theesa.com/facts
- 
- esa entertainment software association
- 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  
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!



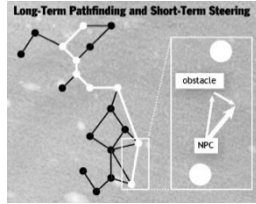
en.wikipedia.org/wiki/Motion\_capture  
www.phasespace.com

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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](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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## Glenn Sugden : My Story

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



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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](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)

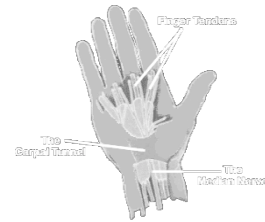


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## Video Games : Bad (RSI, addiction)

- **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](http://en.wikipedia.org/wiki/Video_game_addiction)  
[en.wikipedia.org/wiki/Repetitive\\_strain\\_injury](http://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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