



Future of Games

Developing Gaming Trends



Ancient game of Alquerque

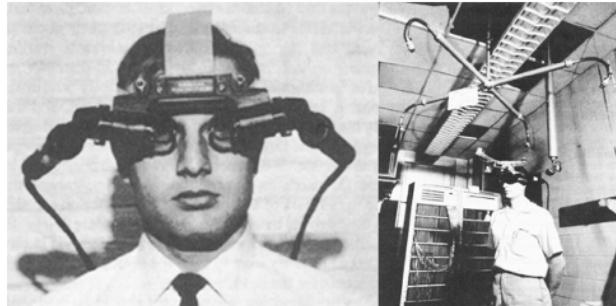
Pursuit of Realism

- Advances in Human Computer Interface



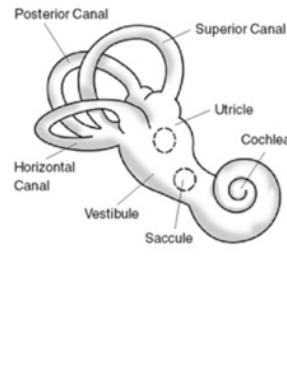
Virtual Reality

- Next step in immersiveness
- Challenges:
 - Simulator sickness
 - FoV
 - Natural Locomotion
 - Haptics
 - Representation of self (proprioception) and others



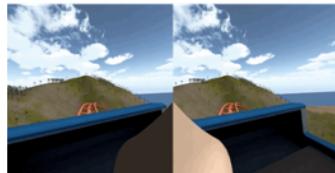
Simulator Sickness

- Possible Solutions
 - Better tracking (latency)
 - Better vision support (accommodation)
 - Adaptive rendering
 - Vestibular Stimulation?



Simulator Sickness

- Dynamic FOV
- During simulated VR motion, shrink FOV to avoid sickening disparity between visual cues and vestibular sense
- Ubisoft's EagleFlight
- Other tricks like virtual nose



<https://www.youtube.com/watch?v=XzAgKgBEEAc>

Roller coaster with nose: <https://www.wired.com/2015/04/reduce-vr-sickness-just-add-virtual-nose/>

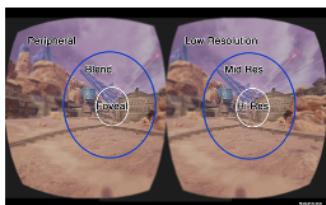
Simulator Sickness

- Vestibular Stimulation

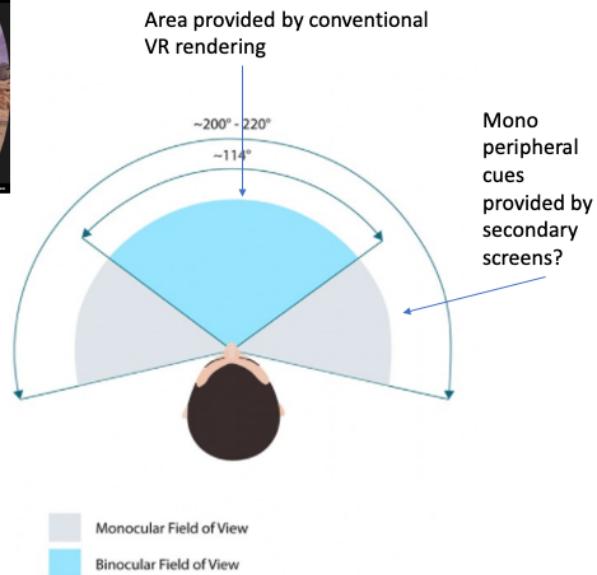


Entrim 4D

FOV

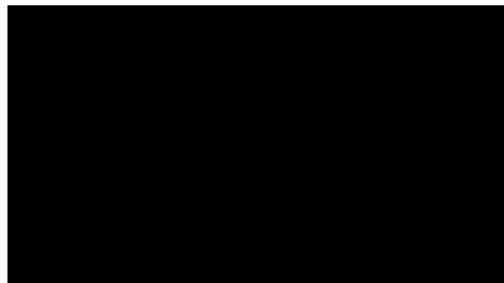
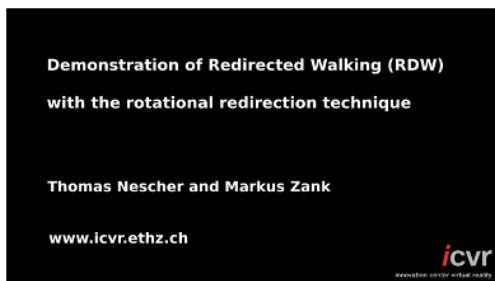


- HMDs ~100 degree FOV
- Peripheral cues?
- Foveated rendering
 - Useful for performance, esp. if coupled with eye tracking
- Faceted display
 - Don't necessarily need lens for peripheral displays
 - Introduces a frame (screen edge between displays). However, those that wear glasses don't have trouble with a frame in view



Locomotion: VR in Confined Space

- Redirected Walking



Omni-directional Treadmill

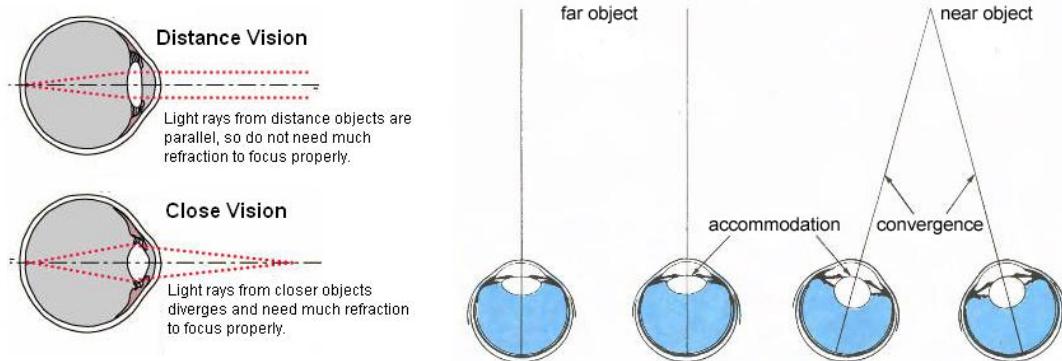


Haptics



<http://www.roadtovr.com/axonvr-making-haptic-exoskeleton-suit-bring-body-mind-vr/>

VR Visual Support - Accommodation



Current HMDs don't know which virtual object you are looking at
HMD virtual binocular image is always at the same distance
User's eye accommodation is always the same, regardless of stereo convergence
Can be confusing, sickening, difficult to perceive, etc.

VR Representation of Self and Others

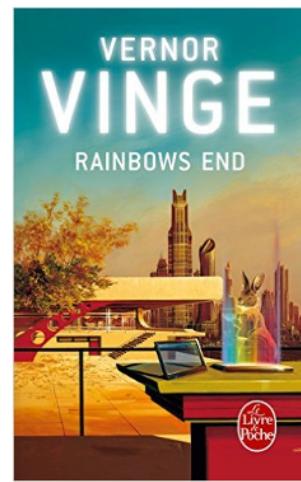
- Proprioception
- Social Cues
 - Eye contact
 - Emotion
- Collaboration



Proprioception - knowing position/orientation of one's own limbs/body

Mixed Reality/Augmented Reality

- "Solves" some of the issues of VR
- More Social
- *Fast Times at Fairmont High* and *Rainbows End* (2006) - Vernor Vinge



Google Glass / Microsoft Hololens



Google Glass can't really create an AR experience

Augmented Reality

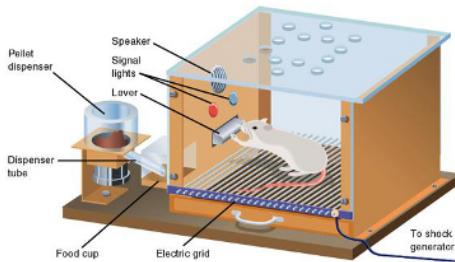
- Has generally harder versions of the issues as VR (e.g. sim sickness and visual quality)
- And additional challenge of ***registration*** (synchronizing with real world)
 - Tracking synchronizing
 - Occlusion effects

Future AR



Free-to-play/Pay-to-win

- Ownership?
- Different than the arcade?
- B.F. Skinner Operant Conditioning
 - Random Ratio Schedule



Rat in box with lever and food dispenser

Fixed interval schedule: food comes out on fixed interval of time (level has no impact)

Fixed ratio schedule: food comes out every time rat presses lever fixed number of times

Random ratio schedule: must press lever a randomly determined number of times (different distributions possible, but probably uniform)

Everquest is Random Ratio Schedule

Gambling in Las Vegas?

Alternate Reality



- Alternate reality game (ARG)
- The Game - directed David Fincher, starring Michael Douglas and Sean Penn (1997)
- Majestic (game - 2001) - one of the first ARGs
- I Love Bees



Serious Games

- Education
- Health/Fitness/Exergaming
- Social Messages
- Gamification of systems/processes



Achievement unlocked



Education

- Training + Simulation
- Assessment/Testing
- STEM

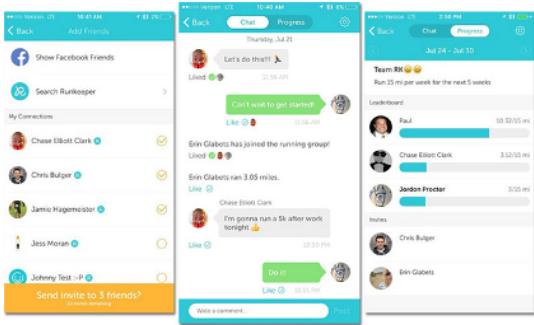


* (Not an actual educational game)

Frog Fractions is a spoof/parody on educational games (and other game related themes)

Fitness/Health/Exergaming

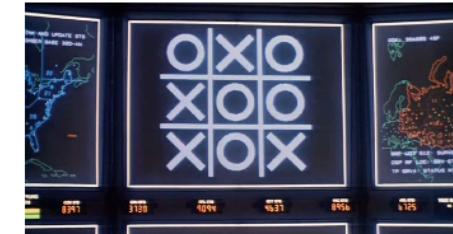
- Behavior Modification
- Motivation for exercise
- Pain distraction



Runkeeper
Exer-bike scene from Black Mirror
Pain distraction for burn victim

Social Messages

- civil rights
- social change
- politics, etc.



Ian Bogost – Cow Clicker
Terrorist Killer (not shown)
Papers, Please
Defcon 5
Airport Security

War Games ('83 movie) Tic Tac Toe scene

Gamification



- Established "boring" (databases, communications, etc.) companies scared to death of losing brain share
- Hope to attract "millennials" through gamification
- Achievements (Avatars, Xbox influence, etc.)
- Gamify government/civil service
- Mechanical Turk
- *Ender's Game* - Orson Scott Card (1985)



Archaeology gamification: <http://www.inquisitr.com/2805405/million-dollars-ted-prize-for-gamification-of-space-archaeology-sarah-parcak-to-launch-worldwide-campaign-to-save-space-archaeology-from-looting/>

Milton from Office Space

Avatar from Black Mirror S1E2

Ender's Game movie battle scene

Changes to Transportation

- Self-Driving Cars
- Transition period
 - Partial automation
- Gamification for attention?
- Gamification for infrastructure monitoring?
 - Points for potholes – Waze!
- Free time to play games?
- Does driving provide some important aspect of human psyche? Can video games replace it?



eSports – Professional Gaming and Fans (and gaming celebrities)

- Paid to play
- Watch broadcasts (Twitch, etc.)



Spectator experience is important part of game design

Fairness important

Emergent gameplay can break a game

In-Progress Games

- Early Access Games
- Kickstarter Campaigns
- Fan Contributions
 - Design Decisions
 - Content Contributions



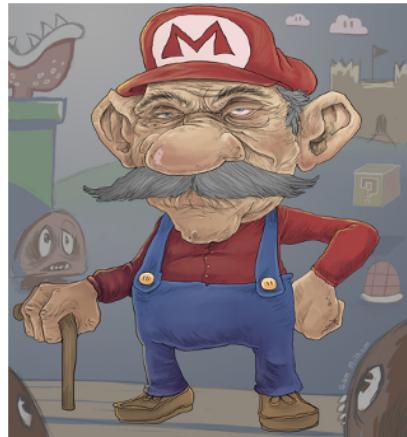
Shroud of the Avatar
Ark Survival Evolved

Mash-Ups

- Composition of elements from different games
- Popular with other media...games next?
- Common game engine (e.g. Unity)
 - Share prefabs?
- Sandbox nature
- Fits well with the “early/preview release” concept



Gaming Zeitgeist



What does gaming tell us about society/cultures/generations?
How does one influence the other?

Generations (Baby Boomers, Gen-X, Millennials, etc.)

- Golden Age of (Arcade) Video Games
 - Arcade
 - Cold War (Missile Command)
 - Space Race (SpaceWar!, Moon Lander)
- 8-bit
 - Scrolling platformers
 - Couch (shared screen) Multiplayer
 - Peak(?) Gender Polarization
 - Hyper-macho – Double Dragon, Contra, Rambo, Ikari Warriors, Top Gun, etc.
 - **Generation X grew up with video games**



Millennials (some Gen Z overlap)

- First generation with broadband Internet
- Services over ownership? Freemium model?
- Games as Social Outlets? Social network integration.
- Games for Social advancement? Create a new world to find success?
- Success of streaming. Twitch, etc.
- eSports
- More niche experiences as opposed to shared experience?
- Sandbox games. Minecraft, GTA, etc.
- EA – Goal of publishing connected games only (multiplayer, “online services”, etc.)
- Gender Polarization changing? More games that appeal to women?
- The “American Dream” – an expectation of baby boomers and gen X, but what about now?
- **What themes do you see?**



<http://www.goldmansachs.com/our-thinking/pages/millennials/>

What do games tell us about generational concerns?

- Zombies
- Survival games
- Post-apocalyptic
- Counterculture (mafia, gangs, assassins, violence)



No longer Nazis and Soviet Union. Instead, we fear some hard to identify, hard to quantify, danger

We are our own enemy?

How to survive this unknown danger?

Counterculture games allow players to express their frustrations with growing disparity between social groups

Rust,

Last of Us

Fallout 4

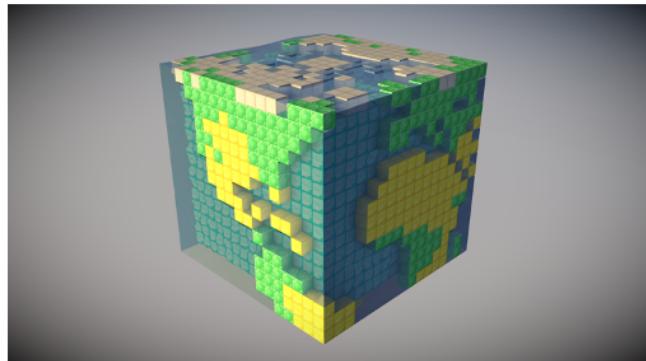
Minecraft

Survivalcraft

ARK Survival Evolved

Trends of Global Communities?

- Outside of US-ethnocentrism
- Video Game Genres?
- 3rd World
 - Technology access?
 - Internet access?
- ???



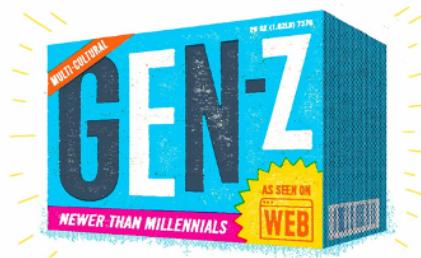
In previous semester, student pointed out that some Asian games embrace fact that most of their audience plays in internet cafes (time reminders, etc.)

Also, eSports bigger in other countries like S. Korea

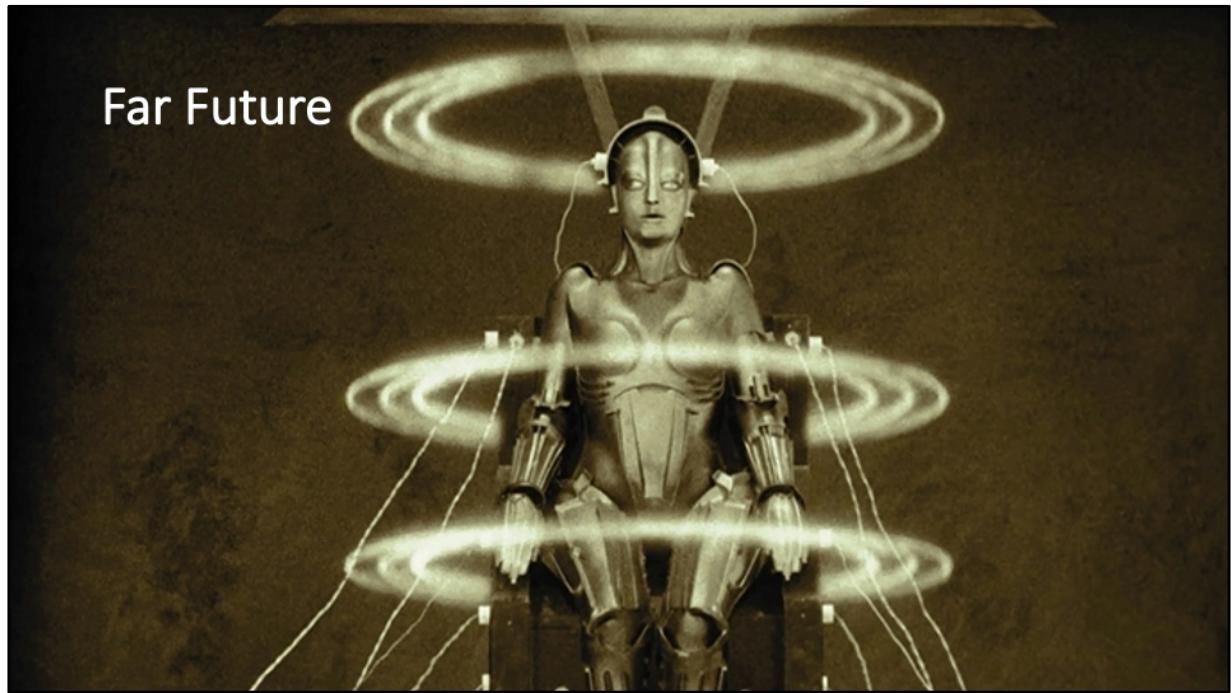
What is the next generation? Generation Z?

Impact of:

- Prevalence of wireless devices, always connected
- Gig Economy
- Machine Learning Applications
- Automation (incl. transportation)
- Wearable computing
- eSports maturing
- Climate Change
- Wealth Disparity
- Debt
- Overcrowding

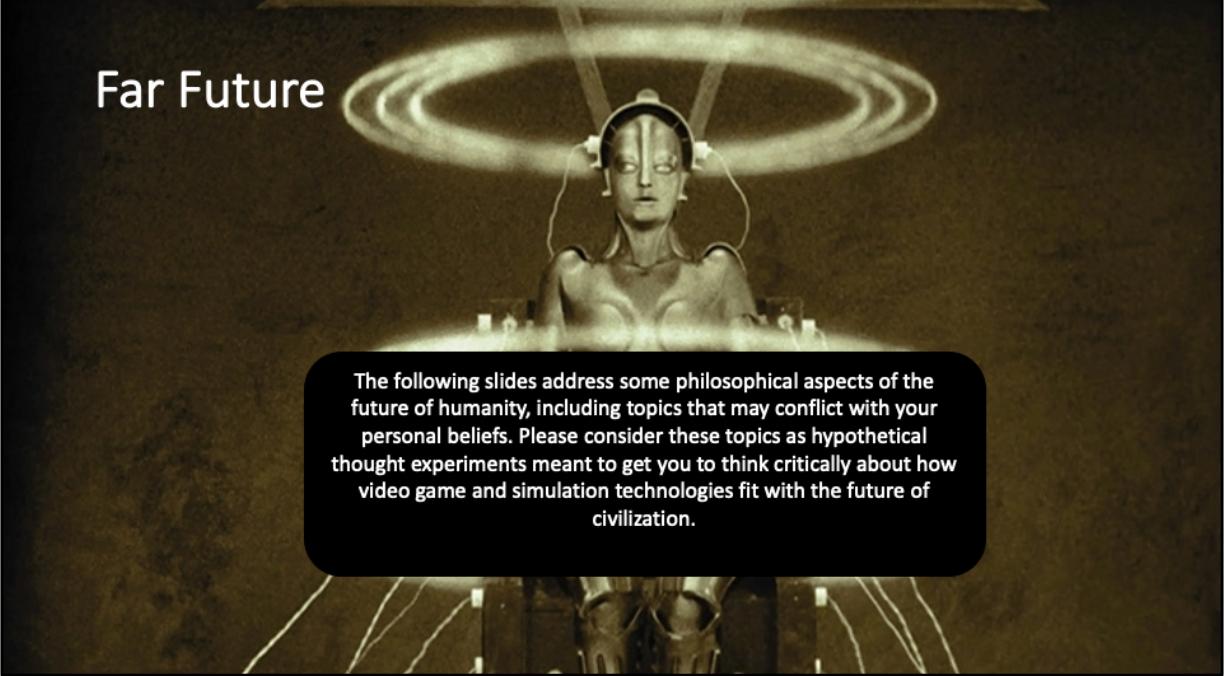


Far Future



From Metropolis

Far Future



The following slides address some philosophical aspects of the future of humanity, including topics that may conflict with your personal beliefs. Please consider these topics as hypothetical thought experiments meant to get you to think critically about how video game and simulation technologies fit with the future of civilization.

From Metropolis

Pursuit of Realism



- Modeling Sensory Experiences vs. Simulation of a Universe
- Models of Human Observable Macroscopic Phenomenon
 - Often disparate models that must be synchronized
 - (e.g. surface rendering + digital audio + Newtonian physics + animation system)
 - Limited interaction of elements within the simulation
 - Illusions
 - Computation dedicated to only the observable phenomenon
- Unified Simulation
 - Emergent observable phenomenon
 - State changes (liquid, solid, gas)
 - Chemistry
 - High computational costs
 - Lighting is still a challenge
 - There is no Theory of Everything to leverage (yet)
 - Tipping point

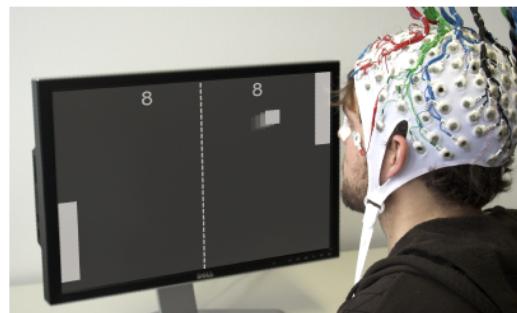


Video: Jelly in the Sky – everything represented with particles

What is more realistic: Minecraft or GTA5?

Brain Interface

Bypass complications of human senses, but new challenges...

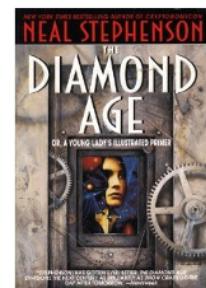


Bypass complications of perceptual system

P300 response – recognition – around 500 ms delay in resp

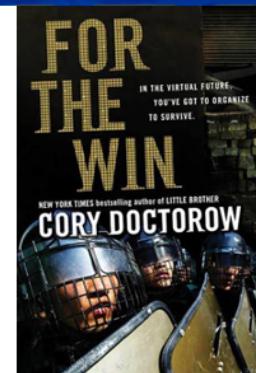
Collapse of Education System

- Education has become expensive
- Technology reinventing how education is done
- Massive Open Online Courses (MOOCs)
 - OMSCS
 - Cheat detection
- *Second Life* - courses
- *The Diamond Age: Or, A Young Lady's Illustrated Primer*, Neal Stephenson (1995)
- *Ready Player One* - Ernest Cline (2011)
- Game/Multimedia platforms become educational systems



Gaming as a job?

- Automation reduces available jobs
- Rich whales main source of income for free-to-play/pay-to-win games
- Lesser players will be paid to provide fun experiences for the whales
- Subscription and free-to-play games often attempt to ban/block user-developed automation so humans grinding is source of income (e.g. Gold Farming)
- Also pro eSports winnings and sponsorships
- *For the Win*, Cory Doctorow (2010)



<https://www.wired.com/2017/02/clive-thompson-future-of-work-is-gaming/>

Abandon Reality for Virtual?

- Cyberpunk future, but nobody ever leaves their home
- *Ready Player One* - Ernest Cline (2011)
- Response to turmoil from overcrowding, wealth disparity, climate change



One Platform – Pervasive Simulation (Game)

- *Neuromancer* - William Gibson (1984) - cyberspace/"matrix" - almost a drug-like description of being connected/wired in
- *Snow Crash* - Neal Stephenson (1992) - The Metaverse - Global Multimedia Protocol Group - fictional part of ACM. Somewhat like WWW
- *Ready Player One* - Ernest Cline (2011) - OASIS



Also Shatner Tekwar
System Shock's Depiction of Cyberspace hacking

Trusted Computing – could lead monopolies on simulation platforms

End of Capitalism as We Know It?

- Down and Out in the Magic Kingdom, Cory Doctorow (2003)
- Guaranteed Basic Income – Money loses meaning
- Post scarcity – basic material goods are ubiquitous; ephemeral but readily generated on demand
 - 3D printers, automation
- Wealth is social “score”?
- Wealth building in games?
 - Games satisfy desire to compete?



Space Travel

- Games a solution for negatives of confinement?
- Entertainment so you don't go crazy
- Provide sensory stimulation
- Simulated social interactions for loneliness
- Stasis (hibernation might require periodic wake-ups with limited mobility – games/VR keep space explorers in their stasis pod)



<http://vrmaster.co/training-for-space-virtual-reality-at-nasa/>

Astronaut Terry Virts practices his Simplified Aid for EVA Rescue (SAFER) training aboard the International Space Station.

The Great Reduction



- Large population of humans becomes “expensive” and “unnecessary” due to factors such as automation, AI, diminished resources, climate change, etc.
- Societies/Governments move towards vast population reduction
- Is this Peaceful or Violent?
- Humanity retracts to cities
- Role of video games/simulation to...
 - Preserve history
 - Capture individual personalities
 - Watch a person long enough, you might be able to algorithmically predict their behavior/interactions in a simulation
 - Capture: Drawing -> Writing -> Photo -> Video -> Interactive Persona



Where does the Pursuit of Realism End?

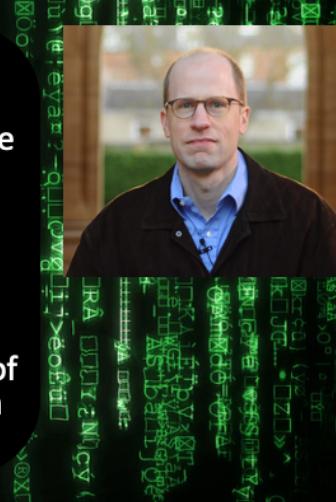


Blue pill – go back to being oblivious of the matrix

Red pill – learn about the matrix

Are We Living in A Video Game/Simulation?

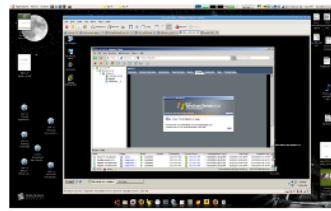
- Nick Bostrom
- "The fraction of human-level civilizations that reach a posthuman stage (that is, one capable of running high-fidelity ancestor simulations) is very close to zero", or
- "The fraction of posthuman civilizations that are interested in running ancestor-simulations is very close to zero", or
- "The fraction of all people with our kind of experiences that are living in a simulation is very close to one"



Simulation Hypothesis: "At least one of the above is very likely true"

Can a Simulation Simulate Another Sim?

- Virtual Machine inside a VM inside a...
- Minecraft Redstone Computer
- Play Maniac Mansion inside Day of the Tentacle
- Diminishing Resources?
- Simulations are natural events?



Matryoshka doll

Maniac Mansion inside Day of the Tentacle

Why would a Complex Simulation (that we exist in) be Running?

- Provide a game-like experience to other beings?
-or.....
- Looking for an answer to a question?
 - What if our universe is a side effect of something mundane like a weather simulation?
- **42**
- Terminating Condition?



Hitchhikers Guide to the Galaxy

"Answer to the Ultimate Question of Life, The Universe, and Everything"

It takes Deep Thought 7½ million years to compute and check the answer, which turns out to be **42**. Deep Thought points out that the answer seems meaningless because the beings who instructed it never actually knew what the Question was.

Perspective on Progress – Negative Outlook

- SF Dystopias allow society to envision undesirable outcomes and therefore work to avoid (1984 – George Orwell)
- *Paris in the Twentieth Century* - Jules Verne (1863)
 - “gas cabs” – internal-combustion engines
 - Paved roads
 - Elevated track trains
 - Fax machines
 - Electric chair, etc....
 - Death of art/craftsmanship/apprenticeship
 - Verne Expressed despair over his predictions

