

Hacking the Brain

Making Games Cerebral



Ne0nRa1n

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Breakdown

- Who are these brain people?
- Brain 101
- Video Game Myths
- History of Game Peripherals
- Industry Current Trends (The Good and The Bad)
- Our Proposal...
- Demonstration

Who are these brain people?

- NeonRain
 - Under-Educated
 - Under-Qualified
 - Visionary dancing monkey extraordinaire
- Julian Spillane
 - CEO, Frozen North Productions, Inc.
 - Chair, Toronto Independent Games Conference
 - Obsessed with strange and innovative peripherals and interfacing them with games...

Brain 101

Or, “The Stuff You’ve Forgotten from Psych Class”

What is the brain?

1 second summary:

Organic Cellular Goodness

What, exactly, does it do?

1 second summary:

Encoding, Storage, Retrieval

How do memories work?

1 second summary:

Neurons That Fire Together, Wire Together

How do we think?

1 second summary:

Pattern-Matching Puzzle Pieces

What About Dreams?

1 second summary:

**I'll Tell You What They Are, But Don't Ask Me
Why We Have Them**

What about consciousness?

1 second summary:

The Questionable Question

How is my Brain Different From a Monkey?

1 second summary:
Bigger and Better

Why Do Drugs Feel So Good?

1 second summary:

The Doppelgangers of Desire

How Does This Relate To Games?

1 second summary:

Repetition of Task = Mastery of Task

Video Game Myths

Or, “Jack Thompson’s Wet Dream”

Myth #1

- Kids have become more violent since videogames have become commonplace in the home.

Reality

- Youth crime remains at, or near, a 30-year low.

Myth #2

- Playing violent videogames makes you more aggressive.

Reality

No research has found that video games are a primary factor or that violent video game play could turn an otherwise normal person into a killer.

Myth #3

- The main market for videogames is children.

Reality

- The average age of most frequent game buyers is 40 years old. In 2006, 93 percent of computer game buyers and 83 percent of console game buyers were over the age of 18.

Myth #4

- Girls just don't like videogames.

Reality

- Thirty-eight percent of gamers are women and women aged 18 or older represent a significantly greater portion of the game playing population (30%) than boys aged 17 or under (23%).

Myth #5

- The military uses video games to train soldiers to kill, therefore video games do the same thing to children.

Reality

- Research points to a fundamentally different model of how and what players learn from games.

Myth #6

- Playing video games makes you a loner.

Reality

- Studies in the US show that 60% of frequent gamers play with friends.

Myth #7

- Playing video games makes you less sensitive to violence.

Reality

- There has been no evidence to suggest that games have a more desensitizing effect than other forms of media.

History of Peripherals

Or, “Knobs, Joysticks, and Wiis”

History of Peripherals

- 1980s – early 90s
 - Video game peripherals were innovative!
 - Unique designs allowed for new styles of gameplay
 - Focused on different skill-sets and each required mastery
- Mid 90s – early 21st century
 - As industry began to grow new technology dwindled
 - Redesign of input meant greater risk
 - Publishers wanted devices that were “market safe” and focused on profit above all else

History of Peripherals

- 2004 - present
 - New rise in innovative input devices
 - Inspired by gamers who have gotten tired of the traditional gaming model
 - Devices take advantage of the body and motion
 - Ex. Nintendo Wii Remote, Donkey Kong Bongo drums, Samba De Amigo marracas, EyeToy camera, Sony Sixaxis controller, dance pads
 - Resurgence in older technology
 - Ex. Lightguns, microphones, touch-screens

History of Peripherals

- 1972
 - Atari Inc. launches PONG to unsuspecting masses
 - Popularizes so-called “Paddle” controllers
 - Device usually consisted of a potentiometer and a few buttons
 - Very first analog input device, paving the way for many more to come



History of Peripherals

- 1977
 - Atari Inc. releases the Atari VCS (Video Computer System)
 - Brought the arcade joystick to home consumers
 - First major home video game console to make use of joysticks
 - Bundled controllers were 4-directional digital one-button joysticks



History of Peripherals

- 1977 (cont'd.)
 - Many knockoffs of the Atari joystick were produced, compatible with the system
 - One, had foot operated switches
 - QJ Footpedal System had three foot-operated switches and a set of configuration switches



History of Peripherals

- 1982
 - General Consumer Electric launches the Vectrex
 - Introduces to the world the first analog joystick, a 3D-visualization peripheral (the “3D Imager”), and made innovative use of the lightpen



History of Peripherals

- 1983
 - Nintendo Corporation unveils the Nintendo Family Computer
 - Introduces first peripheral to include active components in the joystick, as well as the eponymous “d-pad”
 - Joypads used an 8-bit CMOS shift register to tell the console what button was being pressed without requiring a direct wire for each button



History of Peripherals

- 1984-1989
 - Nintendo Corporation launches more peripherals...
 - Nintendo Zapper allowed gamers to “fire” at their games, realistically
 - Nintendo Satellite allowed gamers to use their controllers wirelessly in the same room
 - The Robot Operating Buddy (R.O.B.) made use of optical flashes from the TV and had arms that could move left, right, up and down along with hands that pinched together; worked with two games: Gyromite and Stack-Up
 - The NES Advantage offered home gamers the power of the arcade controller, along with variable-speed turbo and a type of slow motion

History of Peripherals

- 1984-1989 (cont'd)
 - Nintendo Corporation launches more peripherals...
 - The Power Pad was the first floor mat peripheral, containing 12 pressure sensitive sensors (originally developed for World Class Track Meet, but a few other games made use of it as well)
 - The Power Glove (released by Mattel in the US) was the first peripheral to “recreate human hand movements on a television or computer screen” [1]

History of Peripherals

- 1984-1989 (cont'd)



History of Peripherals

- 1989 - 94
 - SEGA launches the SEGA Genesis / MegaDrive
 - Refines Nintendo's "D-Pad" concept and adds three digital buttons for gameplay, and a fourth "start" button
 - Next generation controller has unique "six-button" layout
 - A wide-variety of peripherals released (see: <http://www.vidgame.net/SEGA/peripherals.htm> and <http://www.sega-16.com/Genesis%20Accessory%20&%20Peripheral%20Guide%202.php>)



History of Peripherals

- 1990
 - Nintendo launches the Super NES
 - First controller to make use of shoulder buttons
 - Balanced “diamond” button configuration introduced that is still in use today



History of Peripherals

- 1994
 - SEGA launches the Sega Saturn
 - Unveils with modified Sega Genesis 6-button controller and the Saturn 3D controller which featured an analog stick (the first controller on the market post-Jaguar to feature analog controls)



History of Peripherals

- 1994
 - Sony launches the Sony Playstation
 - Initially launches with the original Playstation controller reusing the “diamond” formation of the SNES and introducing two more shoulder pads
 - Followed up by the Dual Shock controller which introduced two analog sticks as well as rumble functionality
 - Sony is also the first to include a memory card for save game storage



History of Peripherals

- 1996
 - Nintendo launches the Nintendo 64
 - Redesigned three-pronged controller for ergonomic feel
 - Console also saw prominent use of a rumble feature as well as a lock-on technology to other games (mainly Pokémon)
 - First use of a microphone in console games



History of Peripherals

- 2006
 - Sony launches the Playstation 3
 - Simple redesign of the Dual Shock 2 controller
 - Vibration removed due to patent violation
 - SIXAXIS controller has sensors for yaw, pitch, roll, and translational movement



History of Peripherals

- 2006
 - Nintendo launches the Wii
 - Complete revolution in controller design
 - Translational, rotational, and positional sensors make for completely new gaming experience
 - Controller expansion port allows for limitless expansion peripheral development



History of Peripherals

- 2007
 - Emotiv Systems announces their mind control headset peripheral Project Epoc
 - Game controller making use of EEG (electroencephalography) as input stimuli
 - Expanding the way we think about gaming and the impact that games have on the human brain



History of Peripherals

- 2008 and onwards?
 - Where will we go from here?
 - More and more biofeedback games, both released officially and hacked together, are being put out to the public
 - People want more engaging ways to interact with their games
 - Maybe some peripherals that can help improve you as well?

Current Industry Trends

Or, “Get Your WoW Fix, you Junkie!”

Current Trends – The “Good”

- Resurgence in Innovation
 - Wii redefining the social gaming dynamic
 - For the first time parents, grandparents, aunts and uncles are sitting down with their kids and playing games
 - Massively Multiplayer Online Games changing the face of economy and the business world
 - There are people who live off of SecondLife!
 - World of Warcraft has become the new golf...
 - Xbox Live has enabled quick downloads of games
 - Brought back the Shareware / Demo era of gaming...
 - Spore?

Current Trends – The “Good”

- Resurgence in Innovation (cont'd)
 - Nintendo wants to make you think better!
 - Brain Age and similar franchises are a big hit on the market right now and are helping to prove that games can help improve your mind
 - Sony unveiled first customizable platformer
 - LittleBigPlanet will revolutionize the way we think of game content



Current Trends – The “Good”

- Getting people active!
 - The Wii Diet
 - People who keep up a healthy diet and play Wii Sports for over 30 minutes a day have been shown to lose weight (in most cases)
 - This might be one step towards solving our obesity epidemic...
 - Dance Dance Revolution
 - Took North America by storm and hasn't let up
 - Weight-loss programs exist tailored to use DDR as a source of cardiovascular exercise

Current Trends – The “Bad”

- Addiction
 - World of War...crack?
 - Crackdowns on internet cafes
 - People playing WoW without eating, sleeping, etc.
 - Suicides resulting from deaths of characters and in-game hardships
 - Death due to personal negligence
 - Students failing out of college
 - Promotes social “reclusism”?



Current Trends – The “Bad”

- Personal Stagnation
 - A healthy balance...
 - People who play games need to find a healthy balance
 - Find ways to promote both physical and mental activity through gaming
 - Speculation that modern-day gaming is contributing to the obesity epidemic is a half-truth, but there's still merit to the argument
 - Need to fight the perception that games are “mindless” by making gamers think
 - Awareness
 - Need to make gamers aware of their body and their potential

Our Proposal

Or, “Adding Biofeedback to Games To Train Your Brain and Body”

What Can Games Do For Us?

- With the right video game you can:
 - Boost visual skills
 - Lose weight
 - Control ADD
 - Boost language skills
 - Ease pain
 - Improve skills in literacy and numeracy
 - Develop skills in visualization, experimentation, creativity, manual dexterity, strategic and tactical decision-making
 - Help the brain age slower
 - Sharpen vision
 - Control stress and tension

How Do We Achieve Such Wonders?

- Body and brain stimulus!
 - Using biofeedback to provide important information about your vitals
 - Heart-rate to monitor physical stress and tension
 - Galvanic skin response to cover psychological stress and emotion
 - Electroencephalography (EEG) to monitor brain waves
 - Accelerometer to measure bodily motion
 - Thermometer to measure body temperature
 - Etc.

What Do We Propose?


- Use biofeedback response to learn to control your body and brain
 - ADD can be managed by training the brain to focus
 - Similarly, stress disorders can be managed by forcing the user to calm down before the game will continue, or get harder under duress
 - Pavlovian training methodologies for bodily control
- More globally, make use of video games to not only entertain but to enhance your life
- Plus, it'll make for some kick-ass online play...

What Have We Done?

- BioBlox!
 - A biofeedback version of everyone's favourite falling block game
 - Two versions: one measures physical stress by monitoring player's heart rate
 - Game gets harder the greater the heart-rate
 - Another measures emotional state through galvanic skin response
 - Just like Scientologists but without the creepy
 - Game gets harder as players approach an intense emotional state

What Have We Done?

- Updated source available at:
 - <http://www.frozensouth.net/DefCon15/BioBlox.zip>
- Coded in C# (I know, I know)
 - Rapid prototyping, quick interface to USB peripheral using “unsafe-mode” memory access and the HID stack



A special thank you goes to Andrew Brandt for his donation of the Wild Divine game to this project and without whom this speech wouldn't of been possible.

Demo Time!

Or, “Get Your Ass Up On Stage And Play Our Game”

Thank you!

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Any questions?