

A History of Serious Games

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Approved for Public Release. Security and OPSEC Review Completed: No Issues.

- There is way too much material here to talk through in 90 minutes.
- This slide deck is meant to be a shared resource for the community.
- You will find it posted at
 - Modelbenders.com
 - Select "Technical Papers"
 - Slideshare.net
 - Search "History of Games"





Computer **Willer** AppsÓ



Attach

Industries Using Serious Games



Outline



- Ancient Games
- Board Games
- > Military Games
- Electronic Games
- Edutainment
- Serious Games
- > References via Wikipedia

1970 Serious Games Definition

"Reduced to its formal essence, a game is an activity among two or more independent decision-makers seeking to achieve their objectives in some limiting context. A more conventional definition would say that a game is a context with rules among adversaries trying to win objectives.

"We are concerned with <u>serious games</u> in the sense that these games have an <u>explicit and carefully thought-out educational purpose</u> and are not intended to be played primarily for amusement."

Abt, C. (1970). Serious Games. New York: The Viking Press.



2005 Serious Games Definition

Game: "a physical or mental contest, played according to specific rules, with the <u>goal of amusing or rewarding</u> the participant."

Video Game: "a mental contest, played <u>with a computer</u> according to certain rules for amusement, recreation, or winning a stake."

Serious Game: "a mental contest, played with a computer in accordance with specific rules that <u>uses entertainment to further government or corporate</u> <u>training</u>, education, health, public policy, and strategic communication objectives."

Zyda, M. (September 2005). "From visual simulation to virtual reality to games". *IEEE Computer*.





Ancient Games

> Ancient Games

- Board Games
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Dice, 3000BC

- Fortunetelling with Sheep's Knuckle Bones came from India to Africa around 40,000BC
- But the earliest known dice were from Iran around 3,000BC
- Note the idea that the game contains and reveals knowledge that is otherwise hidden from the player.
 - In 3,000BC this knowledge was extracted from mystic sources – the mists of superstition
 - In 2,000AD the knowledge is extracted from complexity – the mists of mathematics and logic







Senet, 3000BC

- Move 7 pieces around the Senet board
 Used knucklebones as dice*
- Egyptian Ancestor to Checkers or Draughts
- Religious mysticism. The space you end at forecast good or bad fortune
- Entertainment and a mystical window





Royal Game of Ur, 2600BC

- Game is called "Ur" for the city where it was found.
- A race competition for 2 players around the board and back to the beginning*
- Rosettes give player another turn*
- The next step is using dice*



* Indicates historical opinion. No direct evidence available.

Backgammon, 2500BC

☆ Also found at Ur

- Perhaps the Las Vegas gaming equivalent of the ancient world
- Combines luck (dice/sticks), skill (choice of move), and power of the gods (rules)
- Throwing sticks are early 2-sided dice
 Also early version of "coin toss"





Liubo, 1500BC

- Chinese game of battle that morphed into a racing game between 1500BC and 1200AD
 - Generals and Pawns
 - Become Fish, Owls, and Stones
- As with many others the exact rules have disappeared



Mancala, 1400BC

- Began as an accounting tool for trading goods
- Evolved into a form of entertainment
 - A means of gambling on cattle, sheep, and goods
- Does being good at Mancala make you better at trading animals and food?







Lessons Learned

- Games have always had a serious purpose
 - ✤ Fortune Telling
 - Religious Divination for Weather, Politics, Disease
 - Accounting for crops, animals, and trade
 - Battle Planning
 - Gambling
- Game mechanisms began to emerge 5000 years ago
 - Random number generator, playing board, rules, strategies
- Serious" is from the perspective of the society
 - Fortune Telling and Divination in 3000BC are equivalent to the use of mathematics and science in 2000AD to understand a complex universe and to make intelligent decisions

Board Games

- Ancient Games
- > Board Wargames
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Wei Hai, 3000BC

- Name means "encirclement"
- > Abstract board on which players placed colored stones
- Details of game have not survived
- Believed to be similar to Japanese game of Go













Chaturanga, 500BC







Xiangqi, 200BC

- Influences of Go and Chaturanga
 - Encirclement
 - Unique identity to pieces
 - Strategic movement of pieces
- Used for military strategy
- Korean variant "Janggi"
 - No central river





* Chess, 500AD

- European evolution of Indian Chaturanga
- "Checkmate" is English form of Persian "Shah Mat", which means "dead king"







 $\ensuremath{\mathbb{C}}$ Copyright, Michael Maggs

Mansion of Happiness, 1843

- Serious Game of its time ... Social Principles and Morals
 - "WHOEVER possesses PIETY, HONESTY, TEMPERANCE, GRATITUDE, PRUDENCE, TRUTH, CHASTITY, SINCERITY...is entitled to Advance six numbers toward the Mansion of Happiness.
 - WHOEVER gets into a PASSION must be taken to the water and have a ducking to cool him...
 - WHOEVER possesses AUDACITY, CRUELTY, IMMODESTY, or INGRATITUDE, must return to his former situation till his turn comes to spin again, and not even think of HAPPINESS, much less partake of it."
- > An entertainment of young George Parker



Monopoly, 1936

- George Parker founded Parker Brothers in 1883
 Invented Banking in 1887
 Bought Monopoly rights from Charles Darrow in 1936
- Monopoly games distributed by the Red Cross to POWs in WWII
 - Board contained 2 files and a compass
 - Hollow piece contained a map of the area printed on silk
 - Real German, Italian, and Austrian money was mixed with the play money





Scrabble, 1938

- Alfred Butts created and manufactured the game at home in 1938
 - ✤ Failed to Sell Any
- James Brunot bought the rights in 1948
 Failed to Sell Any
- In 1952 Jack Strauss, President of Macy's, played the game on vacation and placed a big order for his stores
 - Letter counts unchanged from 1948. Rules simplified.





Family Board Games, 1920+

- Stratego, 1920,
 Diplomacy, 1954,
 Risk, 1959
- Wargaming quick and fun
- Diplomacy was originally a play-bymail game
 - Format often used for strategy games like chess and wargames



Lessons Learned

- The board game form and the rules that govern it evolved over many centuries
- Strategies for controlling territory vs. capturing enemy pieces have been at odds for over 2000 years

Military Games

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Wargaming in the Dirt



Koenigspiel, 1664

- Invented by Christopher Weikhmann
- > 1664 Ulm, Germany
- Checkered Board with 30 Pieces
- > King, Marshall, Colonel, ... Private







War Chess, 1780

- > Invented by Dr. C.L. Helwig
- > 1780 Germany
- ➤ 1666 squares, 120 pieces
- Squares colored for terrain feature
- > Aggregate units Infantry, Cavalry, Artillery



Military School Wargame, 1797

- "Rules for a New Wargame for the Use of Military Schools"
- Invented by Georg Venturini in 1797
- > 3600 squares
- French-Belgian Border



Kriegsspiels, 1811

- Invented by Baron von Reisswitz in 1811
- Contoured terrain, porcelain soldiers
- Introduced the "General Idea"
 - Unique Scenario with Victory Conditions







The American Kriegsspiel, 1879





- William Livermore and Hugh Brown in 1879
- Variable unit icons with strength, type, fatigue, ammunition, and task time indicators
- Topographic Maps
- Pegs-and-Holes firing board

Naval War College, 1886

Opened in 1884

- Develop operational war fighting concepts through research and wargaming
- Wargaming introduced in 1886 by William McCarty-Little
 - Cardboard Ships and Gridded Paper
 - 1895 Studied British Naval Attacks on New York Harbor
- 1897 Teddy Roosevelt presented new problem
 - Japanese/American fight for Hawaii





Naval War College, 1900s



Birth of Miniature Games, 1903

- "The Naval Wargame", Scientific American, 1903 by Fred T. Jane
 - Rules and tools for naval games of war
 - Later author of Jane's Fighting Ships
- Little Wars, 1913 by H.G. Wells
 - Miniature soldiers and cannon
 - Terrain board & rules of operation
 - Championed firing toy cannons rather than calculations for determining outcome of war






Lanchester Equations, 1912

- 1912 Differential Equations
- Predict combat outcomes based on historical data
- Establish a scientific basis for making combat decisions
- Create fundamental mathematical equations which capture the reality of combat

Square Law (Direct Fire)

$$\frac{dD}{dt} = -k_d A$$

Linear Law (Indirect Fire)

$$\frac{dD}{dt} = -k_d AD$$

General Law

$$\frac{dD}{dt} = -k_a A^t D^t$$



Political-Military Gaming, 1929

- Invented by Eric von Manstein
- Explored German invasion of Poland
- Included players at many levels of leadership:
 - President of the League of Nations
 - Cabinet Members of Germany and Poland
 - Diplomats from both countries
 - Military Generals



- Chess board with 2 rows added to each edge, 128 squares
- ➤ 24 pieces on each side
- Explicit representation of military forces of the early 20th century



Japanese Wargaming, 1941

- Fall 1941 Japanese gamed Pearl Harbor Attack
 - ✤ Japanese War College in Tokyo
 - Partial success of attack is credited to wargames
- May 1943 gamed Battle of Midway
 - Aboard the Yamato, Flagship of the Combined Fleet

> Tokyo Naval War College

 Host for regular "Table-top maneuvers"



Game Theory, 1943

- Pioneered by John von Neumann
- The theory of decision making
- Analyzing consequences of actions in light of the actions of an opponent
- Maximize the desired outcome





First Computer Wargames, 1948

Army Operations Research Office at Johns Hopkins University

- "Air Defense Simulation"
 - Hosted on the Univac computer
 - North American air defense
 - Naval anti-aircraft guided missiles

CARMONETTE

- 1953 Computerized Monte Carlo Simulation
- Tank/Anti-Tank (v.I), Infantry (v.II), Helicopters (v.III), Communications (v.IV)
- Operational 1956-1970



Univac I

Charles Roberts, 1952

- Roberts invents board game to "practice war" while awaiting his commission
- Introduces primary pieces
 - ✤ Grid System
 - ✤ Terrain Types
 - Military Units with Ratings
 - Combat Results Table
 - ✤ Die Role
- Published as "Tactics" in 1954
 - Sold 2,000 copies from 1954-58
- Started Avalon Hill in 1958







Defense & Hobby Crossover, 1974

- "War games are the hobby of the overeducated."
 - » Jim Dunnigan, SPI Founder
- DOD hires Simulation Publications Inc. (SPI)
 - 1974 Firefight Platoon leader training
 - 1980 Strategic Analysis Simulation Global warfare
 - \$40,000 contract to Jim Dunnigan





Janus, 1978

- Derived from McClintic Theater Model from the Army War College
- Combat via CRT and random numbers
- Great flexibility to visual representation and combat via look-up table



Naval Warfare Gaming System, 1985



Military Computer Wargaming Evolution



MbdSAF, 19909

- Semi-Automated Forces systems are constructive simulations designed to stimulate virtual systems
- > Operated like a wargame
- Data stream like a simulator
- Human orders augmented by AI



- The sophistication of modeling advances hand-in-hand with available computer technology
- The crossover of Entertainment and Serious applications is not new
 - It was part of ancient games. It was part of gaming in the 1800's and the 1950's

Electronic Games

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Spacewar!, 1961

- ☆ First interactive computer game was invented at MIT
- Built on the DEC PDP-1 computer
- Used circular CRT





Pong, 1972



PONG

© Copyright Atari

Home Game Consoles, 1972



3D Shooters, 1994

- > 1994 Wolfenstein 3D
- > 1993-1995 Doom, Doom II, III
- > 1996-1997 Quake, Quake II, III, IV
- > 1996 Marine DOOM
- > 1999 Team Fortress







Panzer General, 1996

- Board game moved to the computer
- Add animation, sound, smoke, and fire – which do not effect the outcome, just the excitement



© Copyright SSI Software

MVORPG, 1997

Ultima Online

© Copyright Origin Entertainment





Virtual Worlds, 1997



Game Technologies



Lessons Learned

- Computer games are one combination of a number of important computer technologies
- The "serious use" of games is another combination of these technologies
 - It is motivated by the gaming applications, but not identical to it

Edutainment

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Educational Television, 1969

- From Sesame Street
 - Started: November 10, 1969
 - Numbers, Letters, Spelling, Math, Behavior, Social Issues

- To Mythbusters
 - Started: July 2006
 - Science, Engineering, Methods of Experimentation



Up until the late 1960s, the use of television as an educational tool in the US was "unproven" and "a revolutionary concept" (Borgenicht, 1998)

Educational Games, 1986

Carmen Sandiego

- Jump Start
- Math Blaster
- Reader Rabbit





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SGI Flight, 1983

> 1983 Silicon Graphics demo program

- Written by Gary Tarolli
- Inspired by Blue Angles air show at Moffett Field
- ✤ Sales tool for SGI computers

Networking added in 1984

- Two machines on a serial cable
- No interactions
- ✤ 7 frames-per-second
- Demonstrated at SIGGRAPH 1984

> 1985 Modification of Flight program

- Added shooting interactions
- Message packets transmitted at frame rates
- 10 player max because of bandwidth limitations
- Dead reckoning added later to reduce network flooding





Harpoon, 1989

- Based on miniature game by Larry Bond
- > Two-sided naval combat during Cold War
- Entertainment and Military versions





Spearhead, 1998

- MaK teamed with Interactive Magic
- Game version of SIMNET and DIS
- "DIS-lite" to support network multiplayer
- Allows all 4 tank station play
- Infrared visuals
- > Typical military training levels



Political & Medical Gaming







SEND TO FREND BACKTORDARD TAKE ACTION TRANSLATING DENDEDE ABOUT THE CAME WHIP'S PLAYING



Religious Gaming







Americas Army, 2002

- > AKA: Army Game Project
- Army recruiting tool created through partnership between
 - Army Accessions Command,
 - West Point, and
 - Naval Postgraduate School
- Potential recruits experience virtual Army training before entering death match combat levels
- Built on Unreal Engine 1.5, 2.0, 3.0
- Parents: COL Casey Wardynski and Dr. Mike Zyda,
- Multiple Spin-off products. Title is valuable Intellectual Property



DARWARS AVBUSH, 2003

- DARWARS was a DARPA sponsored project (with JFCOM and USMC PM TRASYS) to create training systems that incorporate games and related learning technologies
- AMBUSH! was the game component built on the Operation Flashpoint game
- Transferred to PEO-STRI in 2006 for deployment to Army Units
 - Now deployed to 400 sites







DARWARS Tactical Iraci, 2003

- Language training game developed within the DARWARS program
- Conceived and created at USC ICT
- Spun-off as a commercial company and product







Full Spectrum Warrior, 2004

- Joint Army/Entertainment title for the Xbox
- Create a game with entertainmentlevel quality, but with an embedded Army mission
- Dual-use Applications
- Microsoft agreed to support the title if it could be sold commercially as well
- USC ICT and Pandemic Studios
- Famous for having an Army-mode secret key which was immediately released on the Internet


Bilat, 2006

- PC, game based, cognitive training tool used for developing skills in how to plan for and conduct successful bilateral meetings and/or negotiations in different cultural settings
- Key Learning Objectives to develop skills in:
 - Negotiation Strategy
 - Cultural Awareness
 - Trust-Building Strategy
- Developed jointly by USC ICT, RDECOM STTC, ARL, and ARI
- Scheduled for deployment by PEO-STRI



VBS2/Game After Ambush, 2009

- VBS2 from Bohemia Interactive via LaserShot
- \$17.7M contract to replace AMBUSH
- Acquired with out-of-the-box capabilities, no new development to meet requirements
- Scheduled to deliver 70 suites to 53 locations in 2009
 - Active, Guard, Reserve and Projection units
 - ✤ 3640 computers total
- Licensed for use by anyone in the US Army or any Army project



Future of Serious Games

Promising Seeds

- Virtual Worlds
- Military MMOG
- Cloud Simulation
- Mini-Game Portal

Dependencies

- Cyber Security
- Cloud Assurance
- ➢ 3D Web (no Plugin)
- Mobile Assurance

Serious Games Showcase & Challenge

- Using Serious Games to identify innovative game-based solutions to training problems
- Challenge is open to student teams, small and large business, and government



2007

2008

2006

2008 SGS&C Winners



Î I



Small Business & Overall: Burn Center

unowned land. At the beginning of the game you shouldn't spend all your money buying land because you won't have any money left to zone land as farm or dty in order to start making a profit. If you buy land that is too close to the water you won't be able to zone farms or dities there because it is reserved for levee building (these areas appear orange in the levee cost layer in the view options panel). Hold shift to add to the current selection. Press 'I' to toggle the interface if it gets in your way.

Student: Age of Ecology

People's Choice: Direct Action

Government: Geo Commander

to

UA

.5

The Matrix vs. The Holodeck



Lessons Learned

- New technologies from television to computers – are always suspect when applied to training and education.
- What seems obvious to a later generation was not obvious or accepted when the technology first became available.
- What is the cause?
 - Cultural Fixation
 - Emotional Resistance
 - Technical Limitations
 - Lack of Vision and Imagination

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More References in Wikipedia

- Complete reference list in Wikipedia (http://en.wikipedia.org/)
 - ✤ See: History of Games
 - Add Your Own References

