Design of Game Software

- – Course overview
- – History of Computer Games
- – Game Genres
- – Game Design Overview

Course Overview

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Course Materials

- No required text, but refer the followings
  - Resources on the web
  - OpenGL Programming Guide, Addison-Wesley (The older version 1.1 is available at http://www.glprogramming.com/red/)
  - Computer Graphics with OpenGL, by D. D. Hearn and M. P. Baker, Prentice Hall
  - Mathematics for 3D Game Programming & Computer Graphics, by E. Lengyel, Charles River Media

Course Overview

- ## Evaluation
  - Attendance and Exams: 50%
  - Assignments and Term Projects: 50%

- ## Term Project
  - Goal: Design and implement an interactive computer game
  - Team: 3~4 students work as a team
  - Encourage open source projects

Game Components

- Interactive Graphics
- Modeling
- User Interface
- Sound
- Event Handling
- Networking
- AI

What is a Game?

- Activity engaged in for diversion or amusement (Merriam-Webster)

- A game is a form of art in which participants, called players, make decisions in order to manage resources through game tokens in the pursuit of a goal (Greg Costikyan)

- A great game is a series of interesting and meaningful choices made by the player in pursuit of a clear and compelling goal (Sid Meier)
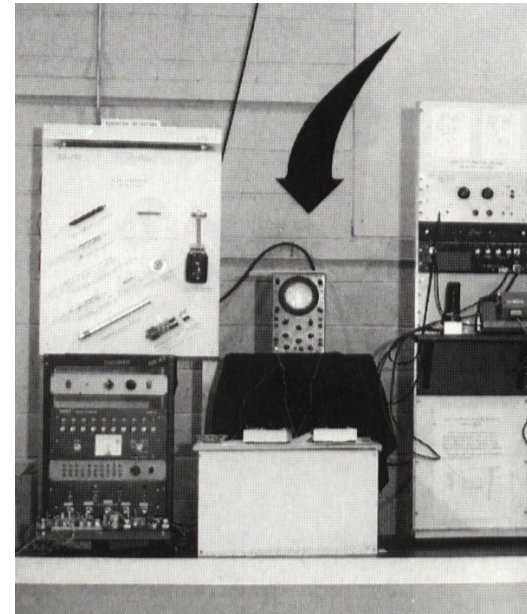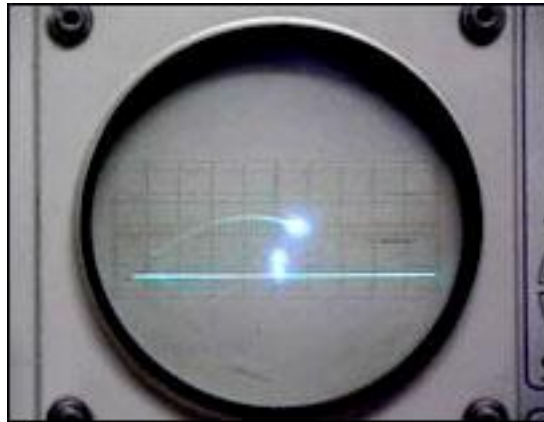
The First Video Games

- Alexander S. Douglas and *OXO(Noughts and Crosses)*
    - Created in 1952 for the EDSAC, U of Cambridge

The First Video Games

- William Higginbotham and *Tennis for Two*
    - Created in 1958 for the Brookhaven National Laboratory's annual visitor day
    - Display was an oscilloscope
    - Sound effects were a side-effect of the relays that made the game run
    - No one realized its significance

The First Video Games

- Steve Russell and *Spacewar*
    - Created in 1962 at MIT for the DEC PDP-1 computer
    - Hugely popular within MIT
    - Required prohibitively expensive equipment ($120,000)
   - Eventually shipped as a diagnostic program with PDP-1s

Games for the Masses

- The Advent of Home Video Games: Ralph Baer and the Magnavox Odyssey
  - 1966, initial idea for a game machine that would work on home TVs
  - Created a shooting game and ice hockey game
 - Sold to Magnavox in 1972

PREHISTORIC SAFARI

Games for the Masses

- **Bringing Games to the Masses**
  - Atari founded by Nolan Bushnell in 1972
  - Brought *Pong* to arcades
  - Sued by Baer and Magnavox
  - Paid a one-time license fee of $700,000
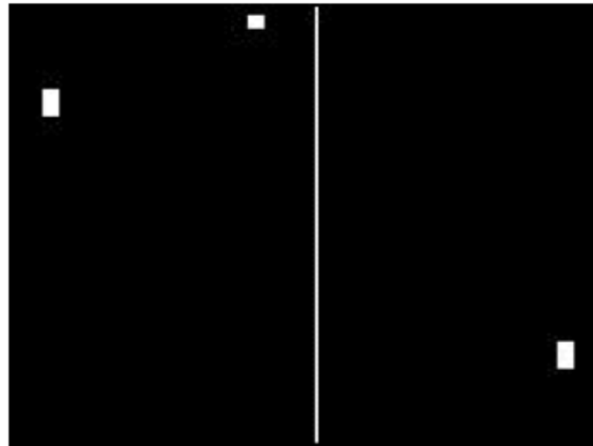
The Console Kings

- **Atari and the 2600**
  - Atari VCS (2600) released in 1977
  - Not quite the first cartridge-based home system
  - Open architecture allowed easy development
  - First to introduce licensing of a system
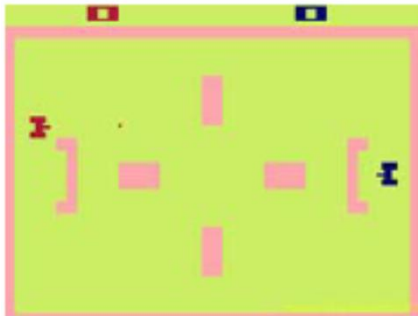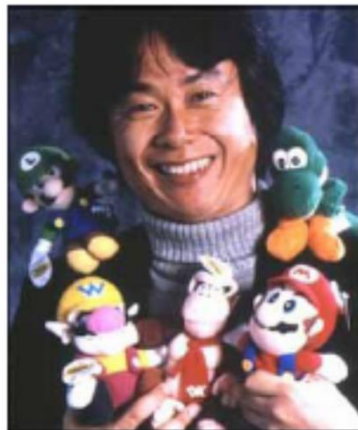
The Console Kings

- Video Game Crash of 1983
  - Factors leading to the crash
    - Poor economy
    - Natural market cycle
    - Video games perceived as fad
    - Glut of poor 2600 games (ex. E.T.)
    - Introduction of home computers

The Console Kings

- **Nintendo and Shigeru Miyamoto**
  - Released *Donkey Kong* arcade machine in 1981
  - Released Nintendo Entertainment System in 1985
  - During late 80's Nintendo owned 90% of the market
  - Later consoles are the Nintendo DS Lite, Wii, and Nintendo Switch

The Console Kings

- Sony's PlayStation
  - Created out of an aborted attempt to launch a CD-ROM based system with Nintendo
  - Released PlayStation in 1994
  - PlayStation 2 released in 2000, maintaining backwards compatibility with hugely popular PS1
  - PS3 in 2006, PS4 in 2013

The Console Kings

- **Microsoft and the Xbox**
  - Xbox released in 2001
  - Based on a PC-like architecture
  - Initially significant money lost on each console sold
  - *Halo, Halo2, and Halo3* are its most popular games
  - Xbox 360 in 2005, Xbox One in 2013, Xbox One X in 2017
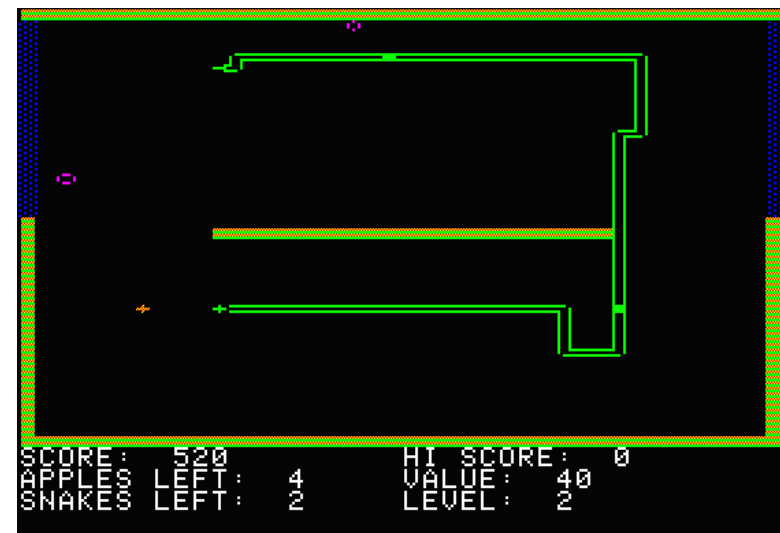
Motion-based Consoles

Nintendo Wii (2006)

MS Xbox360 with Kinect (2010)

Home Computers

- ## Apple Computer
  - Founded by Steve Jobs, Steve Wozniak and Mike Markkula in 1976
  - Apple II was released in 1977
  - Revolutionized the home computer market

Home Computers

- IBM
  - IBM PC introduced in 1981
  - Moderate pricing helped it gain a foothold in the business world
  - BIOS licensing model backfired on them, allowing cheap clones to enter the market

Mobile Games

- Games on Handheld devices (smartphone, tablet computer, PDA, ...)
- OS: IOS, Android, ...
- Social network platform: Facebook, Kakao, ...

Tetris on TI-83 calculator

Anipang

Clash of Clans

- Game Genres

- Game Design Overview

Genres

- Action
  - Typified by fast-paced combat and movement
  - Superset of all other action-oriented genres
    - Shooting
      - FPS (First Person Shooting)
    - Fighting games

Genres

- Adventure
  - Linear storyline in a journey of exploration and puzzle-solving
  - Sub-genres include text-based adventure and graphical adventure
  - Action-Adventure
    - *Tomb Raider*
    - *The Legend of Zelda*

Genres

- ## Role-Playing Game (RPG)

  - ❑ Participants play the roles of fictional characters
  - ❑ MMORPG (Massively Multiplayer Online Role-Playing Game)

Genres

- Strategy
  - Real-Time or Turn-Based
  - Typically, a game in which the goal is to collect resources, build an army and combat the other player or computer

Genres

- **Simulation**
    - Based on the simulation of real-life environments

Genres

- ## Sports/Racing

  - Games that simulate the sporting experience or involve competing in a race in a vehicle

Genres

- ## Traditional
  - Computerized versions of board, word, and card games
  - Poker, Chess, Go, ...

- ## Puzzle
  - Games that combine pattern matching, logic, strategy and luck with a timed element
  - *Tetris* is the breakout hit of this genre

- ## Educational
  - Games designed to teach grade-school concepts to children and young adults
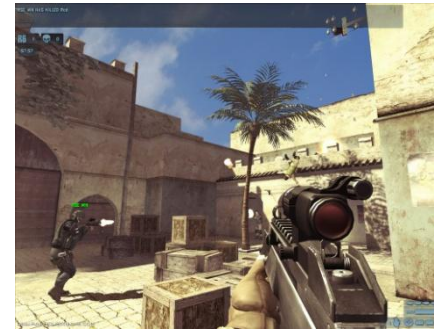
Genres

- **Serious**
  - A game designed to teach real-world events or processes to adults
  - Popular with the US Government and the medical field

Playing Perspectives

- ## First-Person
  - Popular for action games
- ## Third-Person
  - "over-the-shoulder" view
- ## Top-Down
  - Camera hovers over playing area
  - Some strategy games
- ## Side-View
  - 2D perspective

Platform

- Arcade game
- PC game
- Console game
- Mobile game
- Handheld game
- Online game

What things do you look for in a game?

- ## It should be fun
  - Responsibility of **game designers**
  - Interesting plot, rewards, sense of humor
  - Scoring and solving
- ## It should be nice to look at
  - Responsibility of **game artists**
  - Beautiful, realistic, or interesting graphics
- ## It should run correctly & efficiently
  - Responsibility of **game programmers**
  - Multi-platform, multi-player, multi-threaded

What do players want?

- A challenge
- To win
- To socialize
- To play on their own (sometimes)
- Learning (grow up)
- New activities (often, possible only in cyberspace)
- Emotional experience
- To fantasize

What do players expect?

- Consistent game world
- To understand game world boundaries
- Reasonable solutions to problems
- Sense of direction (goals and hints)
- Accomplish goals incrementally
- To be immersed in game world
- To fail
- Fair chance to win
- Avoid unnecessary repetition
- Not to get stuck hopelessly
- Not to be passive watchers of all action sequences

Additional User Expectations

- Various levels of difficulty

- Saving progress

- Custom options
  - Make your own board & characters
  - Change views & controls

- Added perks
  - Soundtrack, easter eggs, …

Game Balance

- Player/Player (Symmetry)
  - Player's performance is based on skill and a little "luck"
  - A player who makes no mistake should not get stuck
- Player/Gameplay (Interaction)
  - game learning should also be fun
  - Reward the player
  - Let the machine do the chores
  - Make a game player-friendly
    - Player should not feel the game is too hard or too easy
- Gameplay/Gameplay (Balance: e.g. rock-scissors-paper)
  - dominated and dominant strategy should not exist
  - Every option should be useful at least in certain situations
  - Comparable choices: e.g. enhance either offense or defense
  - The cost of a feature must match the power of acquiring the feature
  - Tradeoff: physical strength vs. magic power
  - Combination: synergy or redundancy

10 basic rules in [commercial] game design

Concept ⇒ structure ⇒ design

1. Start with a good story and a good concept
2. Write down your design on paper or equivalent
3. Don't bite off more than you can chew
4. Know your target audience e.g. age, gender
5. Come up with a new idea
6. Be flexible following a rapid prototyping mindset
7. Design for the future
8. Think series or sequels
9. Content is everything
   - Use of graphics and technology
   - Game is fun to play
10. Give the players goals