What Do You Think Goes Into Developing Games?

- Choose a game you're familiar with
- Assume you are inspired (or forced or paid) to re-engineer the game
- Take 1-2 minutes to write a list of the tasks required
  - Chronological or hierarchical, as you wish
- Trade write-ups with another student
- What do we have?
Outline

• Background
• What is a Game?
• Genres
• The Game Industry
• Game Timeline
• Team Sizes

Professor Background (Who am I?)

• Dr. Mark Claypool (professor, “Mark”)
  - Computer Science
  - Interactive Media and Game Development
• Research interests
  - Networks
  - Multimedia
  - Network games
  - Performance
Student Background (Who Are You?)

- Year
  - Junior, Senior, ...
- Interest:
  - Art or Programming or ...
- Computer Programming
  - (what’s a program) 1 to 5 (hacker)
- Gamer
  - (casual) 1 to 5 (hard-core)
- Built any games?
- Favorite game?
  - What type of game is it? Why is it fun?
- Other ...

Course Materials

http://web.cs.wpi.edu/~claypool/courses/frontiers-06/

- Slides
  - On the Web
  - PPT and PDF
- Resources
  - Game creation toolkits, documentation, etc.
Overall Course Structure

- 8:30-10:30
  - Technical aspects of IMGD
- 10:30-12:30
  - Communication Workshops
- 1:30-3:30
  - Artistic aspects of IMGD (storytelling)
- 3:30-4:30
  - Lab

Technical Course Structure

- Topics
  - Game Design
    * What is a game, what makes it fun, how to design
  - Game Art
    * What is an animation, how to make sprites
  - Game Programming
    * No programming required!

- Use game development tool ... Game Maker
  - Game development environment
Rough Timeline

• Days 1-5
  - Aspects of game development
• End of day 5
  - Idea for your own game
• Day 6-8
  - Work on game
• Days 8+
  - Game goes live
• Day 10
  - Demo of game (“event“)

Outline

• Background
• What is a Game?
• Genres
• The Game Industry
• Game Timeline
• Team Sizes
What is a Game? (1 of 3)

• Movie? (ask: why not?)
  → no interaction, outcome fixed

• Toy? (has interaction ... ask: why not?)
  → no goal, but still fun (players can develop own goals)

• Puzzle? (has goal + interaction ... ask: why not?)
  → strategy and outcome is the same each time

“A computer game is a software program in which one or more players make decisions through the control of game objects and resources, in pursuit of a goal.”

What is a Game (2 of 3)

• A Computer Game is a Software Program
  - Not a board game or sports
  - Consider: chess vs. soccer vs. Warcraft
    * Ask: What do you lose? What do you gain?
    - Lose: 1) physical pieces, 2) social interaction
    - Gain: 1) real-time, 2) more immersive, 3) more complexity

• A Computer Game involves Players
  - “No, Duh”. But stress because think about audience. The game is not for you but for them.
  - Don’t just think about your story or the graphics or the interface, but consider the players.
  - Ex: complicated flight simulator (say, you are a flying geek) but audience is beginner
What is a Game (3 of 3)

• Playing a Game is About Making Decisions
  - Ex: what weapon to use, what resource to build
  - Can be frustrating if decision does not matter
  - Want good gameplay (next major topic)
• Playing a Game is About Control
  - Player wants to impact outcome
  - Uncontrolled sequences can still happen, but should be sparing and make logical
  - Ex: Riven uses train system between worlds
• A Game Needs a Goal
  - Ex: Defeat Ganandorf in Zelda
  - Long games may have sub-goals
  - Ex: recover Triforce first, then Sword of Power
  - Without game goals, a player develops his/her own (a toy)

What a Game is Not (1 of 2)

• A bunch of cool features
  - Necessary, but not sufficient
  - May even detract, if not careful, by concentrating on features not game
• A lot of fancy graphics
  - Games need graphics just as hit movie needs special effect ... but neither will save weak idea
  - Again, may detract
  - Game must work without fancy graphics
  - Suggestion: should be fun with simple objects

“When a designer is asked how his game is going to make a difference, I hope he ... talks about gameplay, fun and creativity - as opposed to an answer that simply focuses on how good it looks” – Sid Meier (Civilizations, Railroad Tycoon, Pirates)
What a Game is Not (2 of 2)

- **A series of puzzles**
  - All games have them
  - But not gameplay in themselves
  - Puzzles are specific, game systems spawn more generic problems
- **An intriguing story**
  - Good story encourages immersion
  - But will mean nothing without gameplay
  - Example: Baldur's Gate, linear story. Going wrong way gets you killed. But not interactive.
  - Interaction in world all leads to same end.

Games are Not Everything

- **Most important ... is it fun, compelling, engaging?**
  - And these come from a superset of games
- **Computers are good at interactivity**
  - Allow for interactive fun
  - *Interactive Media* and Game Development 😊
- **Examples:**
  - *SimCity* - very compelling, but mostly no goals. More of toy than a game, but still fun.
  - *Grim Fandango* - good visuals, story, etc. But need to do puzzles to proceed. Could have skipped to just watch story. Would still have been *fun* without the gameplay.
Outline

• Background
• What is a Game?
• Genres (next)
• The Game Industry
• Game Timeline
• Team Sizes

Game Types

• What are some types of games?
• Provide examples
• What separates them from others?
Arcade Games

• Reaction speed are the most important aspect of the game
  - Examples: scrolling shooters, maze games like Pacman, paddle games like Breakout, Pong
• Relatively easy to make
• Normally 2-d graphics
• Good starting point for first game

Puzzle Games

• Clever thinking is the most important aspect
• Ex: Many maze games are actually more based on puzzle solving rather than on reaction speed
• Other examples include board games and sliding puzzles
• Normally 2-dimensional
• Relatively easy to create
  - Except when played against a computer opponent
  - Artificial Intelligence can be harder
    * Ex: How to program the computer to play chess?
Role Playing Games

• Steer a character through a difficult world
  - Examples are Diablo and Baldur’s Gate
• Development of character to learn new skills, becoming more powerful, and finding additional and better weapons
• Opponents become more powerful as well
• Can create 2-d or 3-d
• Generally harder to make because must create the mechanism of character development
• Also normally need large world
• Good level design is crucial

Strategy Games

• Real-time (RTS) or turn-based
• Player only indirectly controls the character
  - Tactics less important than Strategy
• Examples include Age of Empires, Warcraft III...
  - Also, usually “God Games”, such as B&W
• Generally take a lot of time to create
  - Require many different game objects, each with animated images and specific behavior
Adventure Games

- Game is about adventure and exploration
  - Story line is rather crucial
- Can be 2-d or 3-d
- Actions easy (just move)
- Difficulty is in making exploration/adventure interesting
  - Interesting, funny, and surprising story line
  - Corresponding artwork
- Artists role crucial

First-Person Shooters

- 3-d version of many arcade-style games (move and shoot)
- Emphasis is on fast-paced action and reaction speed, not on cleverness and puzzle solving
- Many examples: Doom, Quake, ...
- Need to be 3-d
- Relatively difficult to create because of models
Third-Person Action

- Player directly controls a game character (avatar) through a hostile world
  - Ex: Tomb Raider
- Not much emphasis on character development
- Fast action and discovering the game world
- Some have story line, other adventure game aspects
- Can be 2-d or 3-d
- Can sometimes be created easily

Sports Games

- Real-life sport, made virtual
- Ideas, rules in place
- Making realistic, challenging, fun like sport can be difficult
Racing Games

• Drive a vehicle, as fast as possible or sometimes for exploration or combat
• Special type of sport game
• Either realistic (ex: *Formula 1*) or focused on fun aspects (*Midtown Madness*)
• Both 2-d or 3-d

Simulators

• Try for realistic representation
  - Ex: flight simulators
• Other simulations include world simulation
  - Ex: *simCity* or *simEarth*
• Relatively difficult to create since getting details right a challenge
Outline

• Background
• What is a Game?
• Genres
• The Game Industry (next)
• Game Timeline
• Team Sizes

The Game Industry

• 60% of all Americans play video games
  - In 2000, 35% of Americans rated playing computer and video games as the most fun entertainment activity for the third consecutive year
• Computer/video game industry on par with box office sales of the movie industry
  - $6.35B/year for U.S. Sales in 2001
• Development
  - Costs $3M to $10M to develop average game
  - Takes 12-24 months
What Games are Played?

• Console game players:
  - Action (30%), sports (20%), racing (15%),
    RPG (10%), fighting (5%), family
    entertainment (5%), and shooters (5%)

• Computer gamer players:
  - Strategy (30%), children's entertainment
    (15%), shooters (15%), family
    entertainment titles (10%), RPG (10%),
    sports (5%), racing (5%), adventure (5%),
    and simulation (5%)

What about Online Games?

• Not just for PC gamers anymore
• 24% of revenues will come from online by 2010
  (Forrester Research)
• Video gamers
  - 78% have access to the Internet
  - 44% play games online
  - Spend 12.8 hours online per week
  - Spend 6.5 hours playing games online
Game Studios – Vertical Structure

• Developers
• Publishers
• Distributors
• Retailers

• Much like a mini-Hollywood

Developers

• Design and implement games
  - Including: programming, art, sound effects, and music
  - Historically, small groups
  - Analogous to book authors
• Structure varies
  - May exist as part of a Publisher
  - May be “full-service” developers or may outsource some
    * Motion Capture (to replicate realistic movement)
    * Art and Animation (can be done by art house/studio)
• Many started on PC games (console development harder to break into)
• Typically work for royalties & funded by advances
  - Do not have the capital, distribution channels, or marketing resources to publish their games
  - Often seen that developers don’t get equitable share of profits
  - Can be unstable
Publishers

- *Fund development of games*
  - Including: manufacturing, marketing/PR, distribution, and customer support
- Publishers assume most of the risk, but they also take most of the profits
- Relationship to developers
  - Star Developers can often bully Publishers, because publishers are desperate for content
  - Most Developers are at the mercy of the almighty Publisher (details on relationship in Chapter 7.3, done later)
- Originally grew out of developers
- Massive consolidation in recent years
- Most also develop games in-house

Retailers

- *Sell software*
- Started with mail-order and computer specialty stores
- Shift in 80's to game specialty stores, especially chains (Today 25%)
  - *EB Games, GameStop*
- Shift in 90's to mass market retailers (Today 70%) (ask)
  - *Target, WalMart, Best Buy*
- Retailers generally earn 30% margin on a $50 game
- Electronic download of games via Internet still in infancy
  - Big but not huge (Today 5%)
Outline

• Background
• What is a Game?
• Genres
• The Game Industry
• Game Timeline (next)
• Team Sizes

Game Development Timeline (1 of 5)

• Inspiration
  - getting the global idea of the game
  - duration: 1 month (for a professional game)
  - people: lead designer
  - result: treatment document, decision to continue
• Conceptualization
  - preparing the "complete" design of the game
  - duration: 3 months
  - people: lead designer
  - result: complete design document
  - (continued next slide)
Concept

- Define Game Concept
- Define Core Game Features
- Find/Assign Developer
- Estimate Budget & Due Date

Based on notes from Neal Robison, ATI

Concept: Van Helsing (1 of 4)

Gameplay:
Still firing after being hit

Based on notes from Neal Robison, ATI
Concept: Van Helsing (2 of 4)

Based on notes from Neal Robison, ATI

Concept: Van Helsing (3 of 4)

(Van Helsing Pre-Production)

Based on notes from Neal Robison, ATI
Concept: Van Helsing (4 of 4)

(Van Helsing Finished Concept)

Game Development Timeline (2 of 5)

• Prototypes
  - Build prototypes as proof of concept
    • Can take 2-3 months (or more)
    • Typically done a few months in
  - In particular to test game play
  - Throw them away afterwards
  - Pitch to Publisher
• (Continued next slide)
Prototype or 1st Playable

- GDD & TDD = “The Bibles”
- Production Budget & Detailed Schedule
- Submit Concept to Sony, etc.
- Working Prototype, with Game Mechanics
- Focus Test

Prototype: Red Ninja (1 of 3)

Based on notes from Neal Robison, ATI
Prototype: Red Ninja (2 of 3)

(Red Ninja Pre-Production)

Prototype: Red Ninja (3 of 3)

(Red Ninja Final Production)
Game Development Timeline (3 of 5)

- **Blueprint**
  - separate the project into different tiers
  - duration: 2 months
  - people: lead designer, software planner
  - result: several mini-specification

- **Architecture**
  - creating a technical design that specifies tools and technology used
  - duration: 2 months
  - people: project leader, software planner, lead architect
  - result: full technical specification

Game Development Timeline (4 of 5)

- **Tool building**
  - create a number of (preferably reusable) tools, like 3D graphics engine, level builder, or unit builder
  - duration: 4 months
  - people: project leader and 4 (tool) programmers
  - result: set of functionally tools (maybe not yet feature complete)

- **Assembly**
  - create the game based on the design document using the tools; update design document and tools as required (consulting the lead designer)
  - duration: 12 months
  - people: project leader, 4 programmers, 4 artists
  - result: the complete game software and toolset
Other Development Milestones: Alpha Definition

• At Alpha stage, a game should:
  - Have all of the required features of the design implemented, but not necessarily working correctly
  - Be tested thoroughly by QA to eliminate any critical gameplay flaws
  - Still likely contain a certain amount of placeholder assets
  - (Continued next slide)

Alpha Definition

[ Feature Complete

[ "Localization" Begins

[ Focus Test

[ Play Testing

[ Marketing Continues

Based on notes from Neal Robison, ATI
Alpha: Crash Bandicoot (1 of 2)

Based on notes from Neal Robison, ATI

Alpha: Crash Bandicoot (2 of 2)

(Crash Bandicoot)
Game Development Timeline (5 of 5)

- Level design
  - create the levels for the game
  - duration: 4 months
  - people: project leader, 3 level designers
  - result: finished game with all levels, in-game tutorials, manuals
- Review
  - testing the code, the gameplay, and the levels
  - duration: 3 months (partially overlapping level design)
  - people: 4 testers
  - result: the gold master

Other Development Milestones:
Beta Definition

- At Beta stage, a game should:
  - Have all content complete
  - Be tested thoroughly for bugs and gameplay tweaks
  - Be shown to press for preview features
  - (Continued next slide)
Stages of Development: Beta

- Polish, Polish, Polish
- Game Balancing
- Localization Continues
- Demo Versions

Based on notes from Neal Robison, ATI

Other Development Milestones: Gold Master Definition

- At Gold Master stage, a game should:
  - Be sent to the platform holder/s (where applicable) for TRC testing
  - Be sent to press for review
  - Be sent to duplication for production
  - Be backed up and stored
  - (Continued next slide)
Final/GMC/Gold

- The Game is “Done"
- Testing, Testing, Testing
- Intense Pressure
- Submit to Console developers
- Manufacturing Timing

Post-Mortem

- Analysis of PR, Marketing
- Analysis of Production, Source Code
- Archive All Assets
- What went right, what went wrong
- Kick-off the Sequel!

Based on notes from Neal Robison, ATI
Outline

• Background
• What is a Game?
• Genres
• The Game Industry
• Game Timeline
• Team Sizes (next)

Development Team Size

• As late as the mid-80's teams as small as one person.
• Today, teams today ranging from 10-60 people.
• Programming now a proportionally smaller part of any project
• Artistic content creation proportionally larger
• See Gamasutra, (www.gamasutra.com)
  - Search for "post mortem"
  - Game data at bottom includes team size and composition

Laird and Jamin, EECS 494, Umich, Fall 2003
Development Team 1988

• Sublogic’s JET (early flight sim)
  - Sublogic later made scenery files for Microsoft flight simulator
• 3 Programmers
• 1 Part-Time Artist
• 1 Tester

Total: 5

Development Team 1995

• Interplay’s Descent
  - Used 3d polygon engine, not 2d sprites
• 6 Programmers
• 1 Artist
• 2 Level Designers
• 1 Sound Designer
• Off-site Musicians

Total: 11
Development Team 2002

- THQ’s *AlterEcho*
- 1 Executive Producer
- 1 Producer
- 4 Programmers
- 2 Game Designers
- 1 Writer
- 3 Level Designers
- 3 Character Modelers and Animators
- 1 2d and Texture Artist
- 1 Audio Designer
- 1 Cinematic Animator
- 1 QA Lead and Testers

Total: 19+

Development Teams for Online Games

- Star Wars online (2003?)
- Development team: 44 people
  - 50% Artists
  - 25% Designers
  - 25% Programmers
- 3 Producers
- “Live” Team (starting at Beta, 6 months before done)
  - 8 Developers
  - 50-60 Customer support (for 200K users)
  - 1000 Volunteer staff (for 200K users)
A (Larger) Developer Company Today

• Designing and creating computer games is serious business
  - Large budgets ($1 million+)
  - Large number of people involved
  - Large risk
• Wisdom
  - Use modern software development techniques
  - Keep creativity were it belongs
    * In the design
    * Not during the programming