Interactive Media and Game Development

Frontiers 2008

Mark Claypool

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
- Tutorial 1
- What is a Game?
- Genres
- Tutorial 2
- 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
  - Audio and Video over Internet
  - Network games
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://www.cs.wpi.edu/~claypool/courses/frontiers-08/

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

• 8:30-10:30
  - Technical/Design aspects of IMGD
    • 2d game, from "scratch"
• 10:30-12:30
  - Communication Workshops
• 1:30-3:30
  - Artistic/Design aspects of IMGD
    • 3d game, Unreal Tournament Mod
• 3:30-4:30
  - Lab

Technical Course Structure (1 of 2)

• Start around 8:30
• Me: lecture + discussion for 15-30 minutes
• You: work for 30-60 minutes
• Repeat
• Probably more of me talking the first few days, more of you working last few
• During work, TA + Me circulate around for help
Technical Course Structure (2 of 2)

- **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
- **Day 10**
  - Demo of game ("event")
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Tutorial 1

- Work through “Devilishly Easy”
  - Sprites
  - Objects
  - Rooms
  - Events
- Catch the Clown
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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 effects ... 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
  - Most 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* 😊

Discussion

• What are some examples of interactivity at is fun but not a game?
  - *SimCity* - very compelling, but mostly no goals.
    More of toy than a game, but still fun.
• What are some examples of fun graphics and video that are not interactive?
  - *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.
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Game Types/Genres

• 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 \textit{Pacman}, paddle games like \textit{Breakout}, \textit{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

Party Games

- Variety of types
  - Ex: Mario Party, DDR, Karaoke
- Social aspects important with participants in the same space
- Allow for rapid change of turns
- Allow for disparate abilities (beginners and experts, both have fun)
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

Educational Games

• Games are great at teaching ... how to play the game!
• Educational games are designed to teach player knowledge or skill that is valuable outside the game
  - Ex: math, reading, problem solving
Game Maker

• Can make most any game, but best for:
  - Arcade games
  - Puzzle games
  - 2D
• Given time:
  - Think small, but expand if time
  - Few levels (show core idea)
  - Have playable game early
• Can be Party, or Educational, or ...

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Tutorial 2

- Make a game from scratch (Pong)
  - Draw graphics (simple) using built-in editor

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%)
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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)

(Pre-Production)

Prototype: Red Ninja (3 of 3)

(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)

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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 Rabin, 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

Based on notes from Neal Robison, ATI

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
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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