Lecture 18

Game Analytics
The Loss of a Course

**CS/Info 4154: Analytic-Driven Game Design**
- Course that focused on analyzing gameplay data
- Games included code to record what players do
- Students ran statistics to see what worked/failed
- Student altered gameplay to meet certain targets

**No longer exists** for two major reasons
- The faculty member who ran it left Cornell
- Depended heavily on Flash for larger player base
The Loss of a Course

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Unfortunate since more relevant that ever

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Will Break Into Two Lectures

• **Today:** Understanding analytics
  • Why is it so important to modern game design?
  • What are the different kinds of analytics?
  • What types of questions can be answered

• **Next Time:** Implementing analytics
  • How to instrument your code
  • How to record the instrumented features
  • How to visualize the results
The Role of Analytics

- Game development continues after you ship
  - Improvements to expand player base
  - Critical for DLC or in-game items

- Mixture of **business** and **game design**
  - How do you keep players playing the game?
  - What do they like? What makes them frustrated?
  - This is the **new direction of game design**

- Breaks down into **three categories**
  - Categories determined by data complexity
Player Activity Analytics

- Data for a single player
  - Or for a given player group
- Examples:
  - How often do they play?
  - When does the player quit?
  - Can we get the player back?
- Some support from platform
  - Generalities like play time
  - Found in Facebook, Steam
  - Custom solutions for more
Player Activity Analytics

FarmVille DAU

- Facebook Eliminates Pre-Game Gift Interstitials
- Horse Stable Promo Starts
- Christmas and New Year’s Dips

Dates: 19-Nov, 24-Nov, 29-Nov, 4-Dec, 9-Dec, 14-Dec, 19-Dec, 24-Dec, 29-Dec, 3-Jan, 8-Jan, 13-Jan, 18-Jan, 23-Jan, 28-Jan, 2-Feb, 7-Feb, 12-Feb, 17-Feb
Game System Analytics

- Non-spatial game data
  - Behavior of many players
  - Often the game economy
  - Also issues of game balance
- Needs custom data gathering
  - Data tailored to your game
  - And so are the data queries
- But visualization is easy
  - Queries *format* is standard
  - Can use existing viz tools
Game System Analytics

- **Example**: Weapon economy in *Eve Online*

![Graphs showing weapon economy in Eve Online](image-url)
Spatial Data Analytics

[Image of spatial data analytics maps]
Spatial Data Analytics

- **Spatial game data**
  - Where are things happening
  - Critical for big MMOs
  - Also useful in level design

- Requires custom solutions
  - Custom data collection
  - Custom data visualization

- Complex tools made in-house by the game studios
  - Only worth it for big games
Player Activity: Funnel Charts

1000 People Clicked on the Ad
880 People Downloaded Client
650 People Created an Account
550 Entered Credit Card

200 Created a Character
180 Played 15 Minutes

What Happened?
**Goal**: find “pain points”
- When does player quit X?
- Why doesn’t player do Y?
- Less pain = more accessible

- But do not necessarily want to eliminate them all
  - Easy game = casual game
  - Turns off hardcore players
  - Hardcore players are needed for almost any game (?)

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**Funnel Charts and Design**

- Starts Quest Chain
- Completes 1st
- Completes 2nd
- Creates a Character
- Reaches 10th Level
- Reaches 20th
- Joins Guild
Casual and Core are property of **players**, not the **game**

**Casual-Hardcore Spectrum**

Interested ➔ Casual ➔ Commited ➔ Devoted ➔ Hardcore

Only Plays Demo ➔ Weekly Player ➔ eSports Ranked ➔ FPS Games
Casual and Core are property of **players**, not the **game**

Casual-Hardcore Spectrum

- Interested
- Casual
- Committed
- Devoted
- Hardcore

Free-to-Play Games

- Occasional Free Player
- Bought an Item
- Buys a Lot
Casual and Core are property of **players**, not the **game**

Goal of funnel is to find out how far apart these are
Casual and Core are property of *players*, not the *game*

Goal of funnel is to find out how far apart these are
**Game Specific Data**

- Funnel charts are typically game specific
  - **What** distinguishes casual from core?
  - Cannot get this from platform specific tools

- This requires **custom instrumentation**
  - Functions called at specific activity
  - Record result of activity … *somewhere*
  - Almost exactly the same as profiling
  - Except that there are no pre-made tools
Logging Game Data

1. Log
2. Data Store
3. Query 1
4. Query 2
5. Query 3

Game Analytics
Logging Game Data

Will talk about this more next time
Player Logging: Other Benefits

- **Helping players**
  - Restoring lost items
  - Fixing data corruption

- **Finding cheaters**
  - Did they use an exploit?
  - Is their skill plausible?

- **In-game advertising**
  - But beware selling user data
  - Most states have data laws

- Game is run as a **service**
Gameplay Activity

- Very similar to player activity
  - Custom instrumentation code
  - Put in datastore and queried
  - Only difference is what looking for

- Focusing on game mechanics, not individuals
  - But focus on **non-spatial** game systems
  - Want systems that can be visualized numerically
  - Generally means **resources** and **game economies**
EVE Examples: Titanium

- Shuttles can be reprocessed
- Can turn back into minerals
- Can use (for building) or resell these minerals

- Shuttles have a fixed cost
- What if player is bankrupt?
- Gives players a fallback

- Puts price cap on Titanium
- If too much, buy shuttles
- Do we like this design?
EVE Examples: Weapons

- *Trinity* altered gameplay
  - Changed torpedo mechanics
  - Range was made shorter
  - But rate of fire increased
  - But players valued range
    - Torpedos volume dropped
    - Cruise Missiles spiked
    - Similar chart for launchers
  - But this not mean that the redesign was a bad idea
Spatial Game Data

- Needed for anything that depends on location
  - Identify where players are having difficulty
  - Critical for MMOs, large and persistent worlds
  - **Example**: player death heat maps

- Visualization is much, much harder
  - Spatial representation is particular to your game
  - There are no simple, existing solutions
  - Companies create their own custom tools
Spatial Data: Heatmaps

Zone of Death!
SWTOR Example: Chat Logs

Filter on:
How do I…
SWTOR Example: Chat Logs

Filter on:
Bug, Broken
SWTOR Example: Player Deaths

Legend:
Orange = group
Green = solo
SWTOR Example: Player Deaths

Legend:
Orange = group
Green = solo

Enemy level - player level
SWOTOR Example: Patrol Paths

Encounter “pull” radius
Challenges of Spatial Data

- There are many 3rd party data analysis tools
  - Data analysis is a major part of running a business
  - Business tools work well for player analysis

- But spatial data is very *game specific*
  - Superimposed onto your game visuals
  - Must integrate into your rendering engine
  - Limited to high-end game companies

- What can an *Indie developer* do?
The Simplest Option: **Excel**

Game Analytics
The Professional Option: **Tableau**

Hockey Game Session

Choose Player(s)
- B??
- Bru
- Cla
- Dal
- Eri
- Feh
- Gor
- Gre
- Knu
- Lai
- Lun
- Mod
- Mor
- Nea
- Nis
- Nud

Shot Type
- BACKHAND
- SLAP
- WRIST

Shot Timing Profile

Shots by Player

Game Analytics
**Tableau** is Better on *Large* Datasets

**Game Play Analysis**

**Character Types**

- Assassins & Fighters
- Damagers & Tanks
- Hybrid Characters
- Healers

**Summary Statistics**

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<th>Character</th>
<th>Win-Loss Ratio</th>
<th>Popularity</th>
<th>Matches</th>
<th>KDA</th>
<th>Avg Kills</th>
<th>Avg Deaths</th>
<th>Avg Assists</th>
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Summary

- Gameplay analytics are increasingly important
  - Often driven by your business model
  - Crucial for monetized/free-to-play games
  - Skill heavily in demand at most game companies

- Often break data into different types
  - **Player analytics**: activity of a player over time
  - **Gameplay analytics**: game economy and balance
  - **Spatial analytics**: Locality of behavior in game