Lecture 14

Game Analytics
The Rise of Big Data

• Big data is changing game design
  • Can gather data form a huge number of players
  • Can use that data to inform future content

• What can we do with all that data?
  • What types of questions can we answer?
  • How does it affect our business model?

• How do we collect all of this data?
  • What are the technical challenges?
  • What are the legal/ethical challenges?
The Rise of Big Data

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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

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*
Spatial Data Analytics
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: Facebook

- Tracks Facebook API usage
- Game accesses user profile
- Player launches game
- Player sends a gift in game
- Player receives gift in game
- Measures game activity
- How popular is the game?
- Does popularity change?
- Measures social elements
- How much engagement?

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Game Analytics
Player Activity: Facebook

59,943 Aggregation Impressions
61 Aggregation Clicks
0 Aggregations Added to a Timeline
0 Aggregation Highlights

<table>
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<tr>
<th>Date</th>
<th>Impressions</th>
<th>Clicks</th>
<th>Timeline Adds</th>
<th>Highlights</th>
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Player Activity: Facebook

Demographic breakdown for: The number of Open Graph Actions created by this application.

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<th>Female (20%)</th>
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<td>19157 3.9%</td>
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<td>18–24</td>
<td>6.5% 32468</td>
<td>108513 22%</td>
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<td>25–34</td>
<td>8.4% 41608</td>
<td>185226 37%</td>
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<td>35–44</td>
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<td>6637 1.3%</td>
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<table>
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<td>English (UK)</td>
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<td>Swedish</td>
<td>42022</td>
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<tr>
<td>Norwegian (bokmal)</td>
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<td>(2.7%)</td>
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<td>Spanish (Spain)</td>
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<table>
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<tr>
<td>Unknown</td>
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<td>(3.9%)</td>
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</table>
Player Activity: Facebook

![Graph showing daily activity and most shared content on Facebook]

**Daily Likes**: 587 (32%)
**Daily Shares**: 3,136 (3.8%)
**Feedback per Share**: 1.56 (15%)
**Reshare Rate**: 13%

**Daily activity of all pages**

**Daily Most Shared**

<table>
<thead>
<tr>
<th>Page Description</th>
<th>Likes</th>
<th>Shares</th>
<th>Feedback Rate</th>
<th>Reshare Rate</th>
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<td></td>
<td>5</td>
<td>77</td>
<td>1.23</td>
<td>40.26%</td>
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<tr>
<td></td>
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<td>66</td>
<td>1.23</td>
<td>1.52%</td>
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<td></td>
<td>7</td>
<td>66</td>
<td>1.56</td>
<td>30.30%</td>
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<td></td>
<td>15</td>
<td>49</td>
<td>0.65</td>
<td>6.12%</td>
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Drilling Down: Funnel Charts

What Happened?

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
Funnel Charts and Design

**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 (???)

Diagram:
- Starts Quest Chain
- Completes 1st
- Completes 2nd
- Creates a Character
- Reaches 10\textsuperscript{th} Level
- Reaches 20\textsuperscript{th}
- Joins Guild
Casual-Hardcore Spectrum

Casual and Core are property of players, not the game

Interested  Casual  Commited  Devoted  Hardcore

Only Plays Demo  Weekly Player  eSports Ranked

FPS Games
Casual and Core are property of **players**, not the **game**

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**Casual-Hardcore Spectrum**

Facebook Games

- Interested
- Casual
- Commited
- Devoted
- Hardcore

- 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

Interested → Casual → Committed → Devoted → Hardcore
Idea from Web Design: A/B Testing

- Develop two versions of a page
- Randomly show different versions to users
- Track users interact with page
- Evaluate the result with statistics
- Choose the “better” version
A/B Testing in Game Development

- Develop two versions of a game mechanic
- Randomly show different versions to users
- Track users interact with page
- Evaluate the result with statistics
- Choose the “better” version
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

Log → Data Store → Query 1

Data Store → Query 2

Data Store → Query 3

Game Analytics
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!
Simple Solution: Overlays

- Use game drawing code
  - Render world normally
  - Or in a compressed view
  - Integrate in level editor?
- Draw data in layer on top
  - Heat maps for histograms
  - Labels for filtered data
  - Other standard techniques (word clouds?)
- Google tools and HTML5
  - Especially if a web game
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
Summary

• Gameplay analytics are increasingly important
  • Often driven by your business model
  • Crucial for monetized/free-to-play games

• 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

• **Next time**: How do we get all this data?