CS/INFO 4154: Analytics-driven Game Design

Class 16: Internet Telemetry
Mon 10/1
Internet Telemetry

Wed 10/3 @ 10:10am: Beta Prototype

FALL BREAK

Wed 10/10 @ 11:59pm: Beta Report

Fri 10/12
Data Visualization
Outline

1. Principles of logging
2. Logging data
3. Retrieving data
4. Privacy considerations
5. Group activity: logging plan
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Pair discussion: game playing

- **When** do you play video games?
  - Time
    - Morning, afternoon, evening, night?
  - Duration
    - All at once then never play again?
    - In shorter sessions here and there, never more than 10 minutes?
    - Something else?
  - Focus
    - Continuous?
    - Sporadic?
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00am</td>
<td>Starts game</td>
</tr>
<tr>
<td>9:01am</td>
<td>Starts level 1</td>
</tr>
<tr>
<td>9:01-9:10am</td>
<td>Completing level 2</td>
</tr>
<tr>
<td>9:11am</td>
<td>Starts level 2</td>
</tr>
<tr>
<td>9:11-9:17am</td>
<td>Completing level 2</td>
</tr>
</tbody>
</table>
# Reality

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00am</td>
<td>Starts game</td>
</tr>
<tr>
<td><strong>9:45am</strong></td>
<td>Starts level 1</td>
</tr>
<tr>
<td>9:45-9:55am</td>
<td>Random actions in level 1</td>
</tr>
<tr>
<td>9:55am</td>
<td>Restarts level 1</td>
</tr>
<tr>
<td>9:56am</td>
<td>Restarts level 1</td>
</tr>
<tr>
<td>9:57-10:04am</td>
<td>More actions in level 1</td>
</tr>
<tr>
<td>10:04am</td>
<td>Boss walks in. Minimizes game and acts like he is working.</td>
</tr>
<tr>
<td><strong>2:55pm</strong></td>
<td>Maximize game, resume level 1</td>
</tr>
</tbody>
</table>
What are the challenges in logging?

- Sporadic and unexpected player behavior
- Events can get dropped
- Limited space
- Spikes in demand
Principles

1. Record what you need
2. Be mindful of space
3. Include failsafes
Principles

1. Record what you need
2. Be mindful of space
3. Include failsafes
Principle 1: Record what you need

- Consider *decision-significant* information
- Consider your analysis questions
What do we need to record?
Principles

1. Record what you need
2. Be mindful of space
3. Include failsafes
Recording Movement
Ways to do this

- `walk_right walk_right walk_right walk_right walk_right walk_right walk_right walk_right walk_right walk_right walk_right walk_right walk_right walk_right walk_right`
- `walk_right (3 seconds)`
- `player_at(1, 1) player_at(1, 1) player_at(1, 1) player_at(1, 1) player_at(2, 1) player_at(2, 1) player_at(3, 1) player_at(3, 1)`
- `player_at(1, 1) player_at(2, 1) player_at(3, 1)`
Recording Health

- Player health dropped to 99%
- Player health dropped to 98%
- Player health dropped to 97%
- Player health dropped to 96%
- Player health dropped to 80%
- Player health dropped to 60%
- Player health dropped to 40%
- Player health dropped to 20%
Principles

1. Record what you need
2. Be mindful of space
3. Include failsafes
Principle 3: Failsafes

- Logs sometimes get corrupted
  - Events sometimes get lost
  - Mistakes get made

- Advice: add some redundancy
  - Report *global positions*, not *deltas*
  - Periodically report the entire game state
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Logging

- Painful bits are mostly taken care of for you
- Server communications managed through an Haxe/Javascript/Unity library
GDIAC logging framework

- Located on gdiac.cs.cornell.edu
- Data communication through arguments to php
- Data shows up in MySQL database
How would you organize?
### Data organization

<table>
<thead>
<tr>
<th>User 1</th>
<th>Session 1</th>
<th>Task 1</th>
<th>Action 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Task 2</td>
<td>Action 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Task 3</td>
<td>Action 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Task 4</td>
<td>Action 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Task 5</td>
<td>Action 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>User 2</th>
<th>Session 1</th>
<th>Task 1</th>
<th>Action 1</th>
</tr>
</thead>
</table>
How these entities are called:

- Users: “players”
- Sessions: “pageloads”
- Tasks: “levels”
- Actions: “quests”
Logging data

MySQL

php script
php script
php script
php script
Logging API

Five commands:

- **initialize**
  - call before calling anything else

- **recordPageLoad**
  - use once when the player loads the game

- **recordLevelStart**
  - use when the player starts a level (or quest)
  - must follow *recordPageLoad*

- **recordLevelEnd**
  - use when the player ends a level (or quest)
  - must follow *recordPageLoad* and *recordLevelStart*

- **recordAction**
  - use when the player performs an action
  - must follow *recordPageLoad* and *recordLevelStart*
Recording

- Users
  - Sessions
- Tasks
- Actions

- initialize
- recordPageLoad
- recordLevelStart
- recordLevelEnd
- recordAction
Setup: initialize

High-level idea:

- Set a bunch of internal variables for bookkeeping
**Setup: initialize**

**initialize**(gameId, versionId, debugMode, [suppressConsoleOutput]):

- Initializes the logging module
- You *must* call this function when the game starts, or at least before the first event is logged
Setup: initialize

initialize(gameId, versionId, debugMode, [suppressConsoleOutput]):

- **gameId**: Your game's specific ID number (see Piazza post)
- **versionId**: Your game's current version number. You should change this number between releases, and after very large changes to your logging methods.
- **debugMode**: A convenience parameter that disables logging if TRUE. Make sure you set this to FALSE before releasing.
Users and Sessions: recordPageLoad

High level idea:

- register new player or existing player
- make a new user (if unknown)
Users and Sessions: recordPageLoad

recordPageLoad(userInfo):

- Sends data to the server indicating that your game has been loaded.
- Should be called once in the game
- userInfo: Optional. Any additional information you would like to be recorded.
**Quests**: recordLevelStart

High level idea:

- signal start of a task
- associate task with a user and session
**Quests**: recordLevelStart

**recordLevelStart**(questId, questDetail)

- **questId**: An identifying number associated with the level that was just started.
  - If your levels are numbered, just use that number.

- **questDetail**: Optional. Any additional information about the level you would like to be recorded.
**Quests**: recordLevelEnd

High level idea:

- signal end of a task
**Quests**: recordLevelEnd

`recordLevelEnd()`:  
- Sends data to the server indicating that a level has ended.  
- Call this function each time a level ends.
Actions: recordAction

High level idea:

• record an action
• associate it with user, session, and quest
**Actions**: recordAction

**recordEvent**(actionId, actionDetail):

- Sends data to the server about some event that happened in a level.
- Must be called between `recordLevelStart` and `recordLevelEnd`.
- `actionId`: An identifying number associated with the event that just took place. It's your responsibility to assign numbers to events.
- `actionDetail`: Optional. Any additional information about the event you would like to be recorded.
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Retrieving data

MySQL

php script

php script

php script
Pulling Data

Options:

- Large JSON object of everything
- CSV file of key metrics
- Direct database access
## CSV data

<table>
<thead>
<tr>
<th>Player ID</th>
<th>Levels Completed</th>
<th>Time Played</th>
<th>Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>120</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>30</td>
<td>1</td>
</tr>
</tbody>
</table>
Test thoroughly!

- Very easy to get something wrong
- Only one chance for each release!
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XKCD: GDPR

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Data collection is everywhere...
…but so are ethical challenges

The Washington Post

Cornell ethics board did not pre-approve Facebook mood manipulation study

The Guardian

Facebook fiasco: was Cornell's study of ‘emotional contagion’ an ethics breach?

PCWorld

Privacy group files FTC complaint over Facebook's 'emotional contagion' study
Institutional Review Board
1960s: Milgram Experiment
IRB Approval

Institutional Review Board for Human Participants

Notice of Course Activity Approval

To: Erik Andersen
Date: September 05, 2014
Protocol ID#: 1408004901
Protocol Title: CS-4154

The above referenced Course Activity Project was reviewed by Cornell’s Human Research Protection Program (HARP) and approved by the Institutional Review Board (IRB) for Human Participants. This approval does NOT cover students doing research for theses, dissertations, journal articles, public presentations, and oral research projects. Students should be referred to the appropriate IRB office to require the individual student to complete his or her own Initial Approval Request form before beginning recruitment and data collection.

You or your students must ensure that the welfare of the research participants is protected and that methods used and information provided to gain subject consent are appropriate to the activity. You and your students should familiarize yourself with and conduct the research in accordance with the ethical standards of the Belmont Report: http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.html

Please give a photocopy of this approval notice to each student in your class who will be conducting a human participant research project. Acceptance of these terms by students constitutes an understanding that data collection (and allusions to conclusions drawn from these data) from the project(s) covered solely by this approval may never be used for theses, dissertations, articles, or public presentations.

If you have any questions, please contact the IRB office at irbhp@cornell.edu or 254-5162.
An Unbalanced Study of Unbalanced Players versus Balanced

An honors thesis submitted in partial fulfillment of the requirements for the degree of Bachelor of Science.
IRB Approval

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No identifiable data
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In order to make improvements and provide the best possible experience, this game anonymously records user interactions and IP addresses. No personal information is recorded.

This game uses several open source libraries and projects, without which this game would not be possible.
What this means for you

Do not

- record identifiable information
- give data to anyone outside the class
- discuss your data or analysis in
  - public presentations
  - theses
  - journal articles
  - conference papers
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Group Activity

- Come up with a logging plan
  - What events are you going to record?
  - What information is associated with each event?
  - How will you test your setup?