CS/INFO 4154: Analytics-driven Game Design

Class 20:

Data Visualization
**Mon**

10/15 SQL

11:59pm: Midterm Peer Evaluations

**Wed**

10/17 Balance?

**Fri**

10/19 Friends Release

10/12 Data Visualization

by 10:10am: Upload to CMS

**Mon**

10/22 Friends Release

by 2pm: Friends Release Report

**Wed**

10/24 Friends Release

**Fri**

10/26 Friends Release
Logging in to gdiac

- You will need to be behind the Cornell firewall to login to gdiac.cs.cornell.edu
- Easiest way to do this is to install the VPN: http://www.it.cornell.edu/services/vpn/howto/.
- Connect to: cuvpn.cuvpn.cornell.edu
- Username: <your_netid>@en-cs-vpn-acad
- Password = your netid password
- For more information, see: http://www.it.cornell.edu/support/coecis/vpn.cfm.
Logging in: SFAM

- **Set your SFAM password:**
  1. Open a VPN connection to the department VPN
  2. Visit [https://unixcfg.serverfarm.cornell.edu/](https://unixcfg.serverfarm.cornell.edu/)
  3. Click SFAM
  4. Set password
  5. Wait a little bit (30-60 minutes) for server to update

- **With the VPN active, SSH into gdiac:**
  - `ssh <your_netid>@gdiac.cs.cornell.edu`
  - replace `<your_netid>` with your netid
  - you can use PuTTY from Windows machines: [http://www.putty.org/](http://www.putty.org/)
Review: Logging

User 1

Session 1

Task 1
Action 1
Action 2
Action 3

Task 2
Action 1
Action 2

Session 2

Task 3
Action 1

Task 4
Action 1

Task 5
Action 1
Action 2

User 2

Session 1

Task 1
Action 1
Today: data visualization

Burndown Charts

Heatmaps

State transition diagrams
Outline

- Burndown charts
- Heatmaps
- State transition diagrams
Outline

- Burndown charts
- Heatmaps
- State transition diagrams
Burndown Charts

After $x$ levels/seconds, how many people are playing?
Burndown Chart

% of players

Level
Unexpected Drop

% of players

Level

100

0

4
Unexpected Drop

% of players

Level
Usage: find unexpected drop

Source: Sleep Fighter
Usage: track releases

Source: That’s How We Roll
Making a burndown chart

- Microsoft Excel works well
## Making a Burndown Chart

<table>
<thead>
<tr>
<th>Player</th>
<th>Levels Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>

□ = percentage of □ with more than □ levels
COUNTIF(rang, critério)

B2:B8

">=" & D2
### Making a Burndown Chart

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<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
<td>4</td>
<td>0.77777778</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>6</td>
<td>0.66666667</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>8</td>
<td>0.44444444</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>10</td>
<td>0.22222222</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>12</td>
<td>0.22222222</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>14</td>
<td>0.11111111</td>
</tr>
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</table>

= COUNTIF(B2:B8, “>=” & D2)
# Making a Burndown Chart

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\[= \text{COUNTIF}($B$2:$B$8, "\text{>"} & D2)\]
## Making a Burndown Chart

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<td>8</td>
<td>0.444444</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>10</td>
<td>0.222222</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>12</td>
<td>0.222222</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>14</td>
<td>0.111111</td>
</tr>
</tbody>
</table>

= COUNTIF($B$2:$B$8, “>=” & D2) / 7
Completed Burndown Chart?
Completed Burndown Chart

Burndown Chart for Levels Completed

% Remaining

Level

2 4 6 8 10 12 14
Important Notes

Max = 100

Burndown Chart for Levels Completed

- Line starts at 100%
- Must have title
- Must be able to read the font
- Line must be visible
- Must have axis label
- Reasonable intervals
- Must have axis label
Outline

- Burndown charts
- Heatmaps
- State transition diagrams
Outline

- Burndown charts
- Heatmaps
- State transition diagrams
Heatmaps
What are heat maps good for?
Making a heat map

<table>
<thead>
<tr>
<th>Death</th>
<th>X</th>
<th>Y</th>
</tr>
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<tbody>
<tr>
<td>1</td>
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<td>1</td>
</tr>
<tr>
<td>2</td>
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<td>1</td>
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</tr>
<tr>
<td>7</td>
<td>4</td>
<td>3</td>
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</table>
COUNTIF(range, criteria)
COUNTIFS(range_1, criteria_1, range_2, criteria_2)
Making a heat map

= COUNTIFS(B2:B8, "=" & E2, C2:C8, "=" & F1)
Making a heat map

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<tr>
<td>1</td>
<td>1</td>
<td>1</td>
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<td>2</td>
<td>0</td>
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</tr>
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<td>2</td>
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= COUNTIFS($B$2:$B$8, “=” & $E2, $C$2:$C$8, “=” & F$1)
Conditional Formatting
Conditional Formatting

- Highlight Cells Rules
- Top/Bottom Rules
- Data Bars
- Color Scales
- Icon Sets
- New Rule...
- Clear Rules
- Manage Rules...

Apply a color gradient to cells. The color indicates if each cell value falls within a certain range.
Making a heat map

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Completed Heatmap?

Level 10 Heatmap

Zombify, 2014
(with Erik’s additions)
Heat maps should *support analysis*

- Not the point themselves
- *Support* a particular point
Figure 1. This heatmap shows an unexpected problem with the game design. Although this hallway was supposed to be easy, many players died here. We will try to resolve this problem by spacing the enemies further apart.
Figure 1. This heatmap shows an unexpected problem with the game design. Although this hallway was supposed to be easy, many players died here. We will try to resolve this problem by spacing the enemies further apart.
Heat Map Examples

Source: Georg Zoeller, “MMO Rapid Content Iteration” GDC Online 2011
Optimizing Engines

Source: Georg Zoeller, “MMO Rapid Content Iteration” GDC Online 2011
Optimizing Art

Source: Georg Zoeller, “MMO Rapid Content Iteration” GDC Online 2011
How do I...

Source: Georg Zoeller, “MMO Rapid Content Iteration” GDC Online 2011
“bug”
3D Visualizations

Source: Georg Zoeller, “MMO Rapid Content Iteration” GDC Online 2011
More 3D Visualizations

Source: Georg Zoeller, “MMO Rapid Content Iteration” GDC Online 2011
What are heat maps *not* good for?
What about?
Outline

- Burndown charts
- Heatmaps
- State transition diagrams
Outline

• Burndown charts
• Heatmaps
• State transition diagrams
Napoleon’s invasion of Russia

Charles Minard, 1812
Sankey Diagram

State Transition Diagram

- Start
- Lose
- Win!
What can we see?
Making State Transition Diagrams

- Powerpoint works well
Completed State Transition Diagram?

- Start state
- Lose state
- Win state

- 100 players
- 50 players
- 50 players

Needs labels
Needs state descriptions
Outline

- Burndown charts
- Heatmaps
- State transition diagrams
Outline

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- Heatmaps
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