Lecture 12: Balance
Friends Release Tuesday

- Submit your game
  - through CMS
  - through GDIAC website
    - you will receive an email about this
  - before 10:10am
High-level view: were players engaged?
- Report median levels completed and time played
- Show burndown charts for levels completed and time played

Explain the biggest problem with engagement
- What is the problem?
- How did you identify this problem?
  - i.e. burndown chart analysis
- Where is the problem happening?
  - Show a (spatial) heatmap
- What proportion of players are affected?
  - Show a state-transition diagram or temporal heatmap
- How do you think you will fix it?
Years of Balancing
Balancing language

- OP
- imba
- buff
- winrate
- nerf
- broken
- rework
- qq
- underpowered
“Zerg OP, Toss imba!! So can we nerf terran now?”

- rockman
“Zerg OP, Toss imba!! So can we nerf terran now?"

Zerg and Protoss are too powerful so can we reduce the relative power of Terran?
<table>
<thead>
<tr>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>fair</td>
</tr>
<tr>
<td>overpowered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>nerf</td>
</tr>
<tr>
<td>buff</td>
</tr>
</tbody>
</table>
Case Study: Halo Series
Case Study: Halo 1
Halo 1: Overpowered Pistol
Case Study: Halo 2

totally unbalanced
Halo 3 Balance Interface

Pistol: 2
Sniper Rifle: 4
Halo 3 Balance Interface

Pistol: 3
Sniper Rifle: 4
Halo 3 Balance Interface

Are you having fun? Y/N

Pistol: 3
Sniper Rifle: 4
An unbalanced game is…

- Unfair
- Frustrating
- Uninteresting
- Trivial
What is balance?

- Narrowest sense:
  - Fairness
Fairness in competitive games
52-56%
Fairness in noncompetitive games

- When I fail, is it:
  - my fault?
  - the game’s fault?
What is balance?

- Narrowest sense:
  - Fairness

- Expanded sense:
  - Depth
  - Variedness
  - Interestingness
  - Harmony
Key Questions

- How important is playing unpredictably?
- To what extent must players react to the current state of the game?
- How powerful is an action or combination of actions?
- How much long-term strategy is necessary?
- Is the outcome known long before the game’s end?
- What is the effect of avoiding certain end states?
- Are the starting conditions of the game fair?
Basketball
Tic-Tac-Toe

- Fun as a kid
- Not so much as an adult
Perfect Play

100%
Perfect Play

100%
Perfect Play

0%  0%
Perfect Play

draw
draw

first move
Why is balance so hard?

- Complex interconnected systems
- Hard to change these systems on the fly
- Hard to measure balance
- Player behavior changes over time

A < B < C
Metagame

Possible strategies

Known strategies
SlayerS_BoxeR_ (Lim Yo-Hwan)
BoxeR’s famous SCV rush
BoxeR’s innovations

- All-in attacks with workers
- Superhuman micromanagement
- Dropships everywhere
Balancing Techniques

- Symmetry
Case study: Chess
Case Study: Warcraft/Starcraft Series
WarCraft II (and most old RTSes)

Both

Humans

Both

Orcs
StarCraft

Terran  Zerg  Protoss
Balancing Techniques

- Symmetry
Balancing Techniques

- Symmetry
- Tweaking
Balancing Techniques

- Symmetry
- Tweaking
- Tweaking Interface
Tweaking Interface

Pistol: 2
Sniper Rifle: 4
Tweaking Interface

Pistol: 3
Sniper Rifle: 4
Balancing Techniques

- Symmetry
- Tweaking
- Tweaking Interface
Balancing Techniques

- Symmetry
- Tweaking
- Tweaking Interface
- Analytics!
Behavioral Statistics

People Play → Database

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pawn Moves</td>
<td>28% of Moves</td>
</tr>
<tr>
<td>Knight Moves</td>
<td>22% of Moves</td>
</tr>
</tbody>
</table>
League of Legends

Highest Win Rate Champions (9/16/2012 - 9/23/2012)

- Win Percentage
- Popularity Percentage

Mouse over elements for details.
StarCraft II
StarCraft II
Balancing Techniques

- Symmetry
- Tweaking
- Tweaking Interface
- Analytics!
- Game theory
Ideally…

Unbalanced Game

Balanced Game
How fair are the starting conditions?

Player must choose a starting condition $S$. 

---
How powerful is a particular action?

Player cannot play action $A$ more than $k$ times.
How important is long-term strategy?

Player cannot look more than $k$ moves into the future.
**Cards**

- [ ] Analyze Game
- [ ] Include Reports

<table>
<thead>
<tr>
<th>Card</th>
<th>Action</th>
<th>Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>1/2</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>1/6</td>
<td>B</td>
<td></td>
</tr>
</tbody>
</table>

**Balance Measures**

- **Current Game:** R1/1,G1/2,B1/6.
  - **Perfect** (50%)
  - **Aggressive** (43% wins, 0.06% ties.)
  - **Plays distribution over at most 2 actions.** (30.72%)
  - **Greedy** (22.41%)
  - **Button-Mashing** (22.41%)
  - **Never plays R1/1.** (11.54%)
  - **Never plays B1/6.** (11.54%)
  - **Never plays G1/2.** (11.54%)
  - **Plays distribution over at most 1 actions.** (0%)
  - **Always plays R1/1 if possible.** (0%)
  - **Always plays B1/6 if possible.** (0%)
  - **Always plays G1/2 if possible.** (0%)

**Computed Games**

- R1/1,G1/2,B1/6,*2/1.
- R2/5,G3/5,B4/5,+1/3.
- R2/5,G3/5,B4/5.
- R1/1,G1/2,B1/6.

**Overview Visualization**
Balancing Techniques

- Symmetry
- Tweaking
- Tweaking Interface
- Analytics!
- Game theory
Balancing Techniques

- Symmetry
- Tweaking
- Tweaking Interface
- Analytics!
- Game theory
- Storyboarding
Summary: what is balance?

- Narrowest sense:
  - Fairness

- Expanded sense:
  - Depth
  - Variedness
  - Interestingness
  - Harmony
Group Activity: Balance Scorecard!

- Is there a dominant strategy?
- Which mechanics are overpowered? Underpowered?
- How much long-term strategy is necessary?
- To what extent must players react to the current state of the game?
- When the player fails, whose fault is it?