Lecture 7

Economies & Balance
What is Game Balance?

- What does it mean to be unbalanced?
- Examples of unbalanced games?
- Examples of well-balanced games?
- What types of games can be unbalanced?
Types of Game Balance

- **Player-versus-Player**
  - **Fairness**: equal players have equal chance of winning
  - **Pacing**: players have “reasonable” chance of catch-up
  - **Politics**: skill should be more important than alliances

- **Player-versus-Environment**
  - ** Appropriately challenging**: neither too hard nor too easy
  - **Balanced resources**: actions are not too “expensive”
  - **No dominant strategy**: requires multiple play styles
PvE: Appropriately Challenging

- Play should ramp up from easy to harder
  - Early levels are tutorial levels
  - Feeling of accomplishment over time
- **Easy mode** crucial for story-focused games
  - Casual players just want to experience story
  - Should have “press button to win” mode
- **Harder modes** should be hard, not boring
PvE: Balanced Resources

- **Sources**: How a resource can increase
  - **Examples (player)**: ammunition clips, health packs
  - **Example (external)**: spawn points

- **Drains**: How a resource can decrease
  - **Examples (player)**: firing weapon, player damage
  - **Examples (external)**: monster death

- Adjust sources and sinks to “balance” economy
  - Together, determine “price” of resource
  - Price of resource should reflect its “power”
Design Problem: Pricing Resources

**Underpricing**

- Cheap, powerful actions
  - Players favor these verbs
  - Limits play variety

- Examples:
  - Buff spells in most RPGs
  - *Dragon Age* cold spells
Design Problem: Pricing Resources

Overpricing

- Expensive, weak actions
- Usage is “penalized”
- Waste of designers’ time

Examples:
- Shredder ammo in ME2
- *Raise Dead* in early D&D
Design Problem: Pricing Resources

Underpricing

- Cheap, powerful actions
  - Players favor these verbs
  - Limits play variety
- Examples:
  - Buff spells in most RPGs
  - *Dragon Age* cold spells

Overpricing

- Expensive, weak actions
  - Usage is “penalized”
  - Waste of designers’ time
- Examples:
  - Shredder ammo in ME2
  - *Raise Dead* in early D&D

- Resource usage determines difficulty

  - *Resident Evil*: Availability of ammunition
  - D&D 3.x: 20% resource per encounter
Resources and Strategy

• What is more “dangerous”?  
  • Damage-dealer  
  • Healer  
  • Controller (lock-down skills)  
  • Summoner (chain or simple)

• How does this affect strategy?

• Is the answer always the same?  
  • How do you analyze this?  
  • What resources do each of the archetypes above involve?
Resource Analysis: Dungelot

- Simple combat mechanic
  - Each round, swap damage
  - Enemy dies when health is 0
- Player goes until health is 0
  - There is healing in game
  - …but too sparse to go forever
- Two primary characters
  - Paladin: can lessen damage
  - Vampire: drains blood to heal
  - Which is better?
Bad Design: “Engines”

- Actions combine to make resources free
  - Spend one resource to get another
  - Use new resource to get old one back

- Example: *Dragon Age*
  - Resources: Health, Mana
  - Small health loss; regain much mana
  - Small mana loss; heal much damage

- Solution? Cool-down time
Bad Design: Deadlocks

- Cyclical interaction between sinks & sources
  - Prevents any further action
  - Example: Settlers 3
    - Need stone for stonecutter’s hut
    - Stonecutter’s hut is source for stone

- Treat deadlock as a loss condition
  - Example: No more builders in Starcraft
  - But detection of deadlock is hard
PvE: No Dominant Strategy

• “Rock-Paper-Scissors” model
  • No strategy always wins
  • Optimal depends on context
  • Challenge is finding context

• Play is **highly variable**
  • Monotonous play is punished
  • Must master different styles

• Play becomes **psychological**
  • What is opponent thinking?
  • True even if opponent an AI
Meaningful Choice?

- Isn’t this a bad design?
  - Game “feels” random

- Don’t make actions equal
  - Just make nothing the best
  - But some actions are worse
  - **Challenge**: separate two

- Make AI “predictable”
  - Best move if know opponent
  - Player learns how AI thinks
  - Challenge for AI design
Types of Game Balance

- **Player-versus-Player**
  - **Fairness**: equal players have equal chance of winning
  - **Pacing**: players have “reasonable” chance of catch-up
  - **Politics**: skill should be more important than alliances

- **Player-versus-Environment**
  - ** Appropriately challenging**: neither too hard nor too easy
  - **Balanced resources**: actions are not too “expensive”
  - **No dominant strategy**: requires multiple play styles
PvP: Fairness

- **Symmetric**: have same start position & rules
  - Easiest way to achieve fairness
  - **Examples**: Chess, monopoly, *Warcraft II*

- **Assymetric**: start & play with different rules
  - Fairness harder, but more interesting
  - **Examples**: Fox & Geese, *Starcraft*

- Requires user testing
Assymetric Gameplay
PvP: Pacing

- Pacing is a function of feedback
  - **Positive feedback**: rewards player successes
  - **Negative feedback**: punishes player successes

- Positive feedback leads to **snowballing**
  - Once player gets ahead, hard to catch up
  - Opponent will quit early (redefine loss, victory)

- Negative feedback leads to **stalemate**
  - Game goes on forever without a winner
  - Even worse, winner may feel arbitrary
Feedback

• Common form of emergent behavior
  • Game mechanics produce certain outputs
  • Outputs then modify the game mechanics

• **Positive**: reward player for success
  • Extra-lives in any arcade game
  • Power-ups/abilities in Raiden clones

• **Negative**: handicap player for success
  • Blue shells in *Mario Cart*
Feedback: *Raiden*
Feedback: Mario Cart
## Positive Feedback

- Can be *constructive*
  - **Ex:** Increase attack
- Can be *destructive*
  - **Ex:** Drain opponent
- **Key Features**
  - Magnifies early successes
  - Increases player disparity
  - Make game end quickly

## Negative Feedback

- Can be *constructive*
  - **Ex:** Boost opponent
- Can be *destructive*
  - **Ex:** Drain player
- **Key Features**
  - Magnifies later actions
  - Equalizes player status
  - Make game end slower
Sprint: No Feedback

![Graph showing Player Advantage over Game Duration](image)
Too Little Positive Feedback

Game Balance
Too Much Positive Feedback

A

B

Game Duration

Player Advantage

Game Balance
Powerful Negative Feedback

![Graph showing game duration and player advantage]

- **Game Duration**
- **Player Advantage**

A successful game design initiative at Cornell University, focusing on powerful negative feedback and player advantage over the game duration.
Ideal Game Progression

![Graph showing ideal game progression with Player Advantage on the y-axis and Game Duration on the x-axis. The line oscillates between points A and B, indicating fluctuations in player advantage over time.]

Game Balance
Ideal Game Progression

Tricky part is figuring out what the axes mean.
Parameter Tuning

• **Recall**: mechanics have parameters
  • How fast you can run
  • How far you can jump

• **Tuning**: adjust these parameters
  • Allows you to control feedback
  • How bad should blue shell effect be?

• Tuning requires a **lot** of playtesting
PvP: Politics

- Politics occur from **player alliances**
  - Players “gang up” against an opponent

- Problem with politics
  - Turns the game into a form of “voting”
  - Winner a matter of popularity, not skill

- What games are susceptible to politics?
  - Game must support **more than two players**
  - Game must allow **resource sharing**
Are Politics a Bad Thing?

- Not necessarily; some players like them
  - Make a strategy game more social
  - Example: *Settlers of Catan*
    - Trading resources is important
    - Consider player advantage in trade

- Impossible to eliminate in some games
  - Example: free-for-all games, wargames

- Just be aware in player testing
Kingmaking

- Player “chooses” winner
  - Extreme form of politics
  - Voting is not necessary
- Forms of kingmaking
  - Excessive aid to “king”
  - Sabotaging other players
  - Blocking player obstacles

- **Snowballing** encourages kingmaking
Controlling Politics

- Make the game more like a race
  - Players have little ability to influence each other
  - Examples: footrace, backgammon, high scores

- Make *sabotage* resource expensive
  - Loss of resources disadvantages saboteur later
  - Example: base defenses in a strategy game

- Limit opportunities for *alliances*
  - Make it difficult for players to share resources
  - Example: cannot trade cards in Risk
Summary

- Game balance does not need an opponent
  - Appropriately challenging: neither too hard nor too easy
  - Balanced resources: actions are not too “expensive”
  - No dominant strategy: requires multiple play styles

- Multiplayer games introduce other issues
  - Fairness: equal players have equal chance of winning
  - Pacing: players have “reasonable” chance of catch-up
  - Politics: skill should be more important than alliances