Functionality, Completeness, Balance, Interesting Choices

What do I do with my playtesting data?

- What to test for in each stage
  - Foundation (basic idea)
    - Is this idea compelling? FUN?
  - Structure (rules and procedures)
    - Functionality and fun
    - Is this concept worth continuing?
  - Formal Details (fleshed out game)
    - Functionality, internal completeness, and balance
  - Refinement
    - Was the fun removed by the previous step?
    - Accessibility

Functionality

- Can the game be played (in some form)?
- Rules and procedures in place
- Can a resolution be reached?

Internal Completeness

- Are there missing elements?
- …gaps in the rules?
- …loopholes, dead ends, game breakdowns?
- Unexpected dominant strategies
  - Example: spawn camping

…some spawn camping solutions

- Spawning points = # of players
- Spawn Force field / invulnerability
- Random spawn points
- Invisibility when spawning
- No spawning (last man standing)
- Spawn points can be “neutralized” by opponents
- Large spawn area and maybe player defined spawn point
- Spawn point deathtrap for opponents
- Vigilante justice, “rules of engagement” rating
- It’s a feature not a bug!

Loopholes

- Players are very resourceful
- Very difficult to eliminate totally
- Asteroids (safe place on screen)
- "rocket jumping" (ROTT, Quake, Halo2)
  - …or is it a feature?
- Mario64 (failure of collision detection)
- Example: player killers

Dead Ends

- Player(s) cannot continue towards goal
- Your actions/choices in the past (or a bug) doom you to limbo
- Deadlock between competitors

Balance

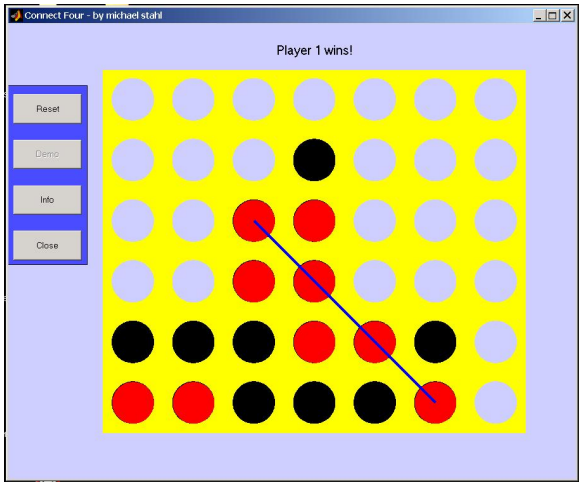
- The process of making sure the game meets your player experience goals
- Are game elements working together with undesired results?
- Is there a dominant strategy or player?
- Is the skill level appropriate for target audience?
- Assessing this may involve some complex math

Areas to Balance

- Variables
- Dynamics
- Starting Conditions
- Skill

Variables

- The properties of the game elements
  - Size of arena, hit points, shields, money/costs, # of players, # of lives, speed etc.
- Example: Connect Four
  - 7 x 6 grid versus 8 x 6



Variables

- Example: WarCraft III
  - Started with big numbers, then tuned them down
  - Less units, "concentrating the coolness"
  - Number of races (9 to 6 to 5 then to 4)
    - Demons messed up the balance
  - Heroes
    - No more "fodder units", so heroes can have impact
      - But how do you enforce this?
        - Unit cap didn't work
        - Upkeep (had to change the name from "tax")
    - Originally 4 per race, then 3 (Petitions to reinstate "Ranger")
  - Continuous patching as players become more adept

Dynamics

- What happens when the system is set in motion?
  - Combinations of rules and actions can cause imbalance
  - Dominant strategies, objects
- Avoid reinforcing relationships
- Add in randomness to even the scales
- Sweeping victory is satisfying

Dynamics

- Symmetry
  - Rotational Symmetry (Rock Paper Scissors)
  - Remove turn order bias with chance or lots of turns
- Asymmetrical games
  - Examples: fighting games, RTSes, historical games
  - More fun?

Dynamics

- Asymmetrical Objectives
  - Ticking clock
  - Protection
  - Complete Asymmetry

Skill

- If no explicit skill levels, balance for medium skill
  - High and low water mark from expert and novice gamer
- Dynamic balancing of skill
  - Tetris, MarioKart64
  - must avoid counterintuitive play as strategy

How do I balance my game!?

- Divide game into discrete functional units
  - Resource management, combat, magic etc.
- Focus on one subsystem at a time
- Make one change at a time
- "Purity of Purpose"
  - Each component has single,clearly defined mission
  - Nothing exists for no reason
  - Nothing has more than one function
  - Try stripping out game elements
- Spreadsheets
- Trust your intuition

Interesting Choices

Improving Player Choices

- What makes choice interesting versus uninteresting?
- How can you design choices that are interesting?

Consequences

- Choices should have consequences.
- Or, each choice must alter the course of the game.
- Upside and Downside to each choice
- Common flaw in existing games: Choices that have no bearing on outcome
- Examples of poor choices: too many weapons that are too similar, side quests/mini-games with no real impact

Types of Decisions

- Hollow Decision: no real consequences
- Obvious Decision: no real decision
- Uninformed Decision: an arbitrary choice
- Informed Decision: where the player has ample information
- Dramatic Decision: taps into a player's emotional state
- Weighted Decision: a balanced decision with consequences on both sides
- Immediate Decision: has an immediate impact
- Long-Term Decision: whose impact will be felt down the road

Dilemmas

- Situations where player must weigh the consequences of their choices carefully
- In many cases, there is no optimal answer
- Often paradoxical or recursive
- Von Neumann studied dilemmas, diagrammed showing potential outcomes

Cake-Cutting Dilemma

- Divide a piece of cake between two children
- Each wants the largest piece
- Mother assigns one to be “cutter” the other as “chooser”
- Cutter slices the cake, chooser picks their slice

Chooser's Strategies

Cutter's Strategies	Choose Bigger Piece	Choose Smaller Piece
Cut as Evenly as Possible	**Chooser gets a slightly bigger piece.**	Chooser gets a slightly smaller piece.
Cut One Piece Bigger	Chooser gets a bigger piece.	Chooser gets a smaller piece.

Zero-Sum Game

- Total amount won at the end of the game is exactly equal to the amount lost.
- Cake-Cutting Dilemma is an example
- Interests of players are diametrically opposed.
- What one player loses is gained by the other.

Minimax Theory

- Von Neumann discovered that there is an optimal strategy for each player in zero-sum games
- Optimal strategy is “maximize their minimum potential result”

Problem with Zero-Sum Games

- Once players are aware of the optimal strategy, they will always use that strategy
- **Obvious Decision**
- How can we create more complex dilemmas?

The Prisoner's Dilemma

- Created by two RAND scientists in the 1950's
- Showed how non zero-sum games can create situations where the optimal strategy for each player can result in sub-optimal strategies for both

The Prisoner's Dilemma

- Two criminals commit crime together
- Caught by police
- Held in separate cells with no means of communication
- DA offers each a deal, says that both are getting the same deal:
  - Rat on partner, he denies it, you go free and partner get 5 years in jail (and vice versa)
  - Both rat: each gets 3 years
  - Neither rat: each gets 1 year

Thief B's Strategies	Thief A's Strategies: Rat on B	Thief A's Strategies: Don't Rat
Rat on A	A: 3 years B: 3 years	A: 5 years B: 0 years
Don't Rat	A: 0 years B: 5 years	A: 1 year B: 1 year

Hierarchy of Payoffs in the Prisoner's Dilemma

- Temptation for defection (0 years)
- Reward for mutual cooperation (1 year each)
- Punishment for mutual defection (3 years each)
- Sucker's Payoff for unreciprocated cooperation (5 years)
- Temptation > Reward > Punishment > Sucker
- If this hierarchy exists, the optimal strategy for each player will always result in a payoff that is less that if they had acted cooperatively.

Hypothetical Game Using Prisoner's Dilemma

- Steve Boscska/Radical Entertainment presented at GDC
- Building/Customizing Spacecraft game

Spacecraft Game

- Requires bartering and trading of raw materials with budget of $10000, but high transaction cost of $8000 “shipping and handling”
- Technology can be purchased ($5000) that allows materials to be transported free of tax but…
- …both players must purchase

Player B's Strategies	Player A's Strategies: Buy Transporter	Player A's Strategies: Keep the Status Quo
Buy Transporter	A: $5k B: $5k	A: $0 B: $13k (B goes bankrupt)
Keep the Status Quo	A: $13k B: $0 (A goes bankrupt)	A: $8k B: $8k

Puzzles

- Contextualize choices that player makes: moving towards or away from solution?
- Key element in creating conflict in many single-player games
  - Innate tension in solving puzzles
- Tie to system of rewards for success and punishment for failure
  - transforms into a dramatic element
- Puzzle should be integrated seamlessly into game
  - Advance storyline
  - Enable progress

Rewards and Punishment

- Most direct consequences for player choices
- Emphasize rewards, while limiting punishments
- Threat of punishment, *not punishment itself*, carries dramatic tension
- Rewards should have utility or value

Reward System Guidelines

- Rewards that are useful in obtaining future victory carry greater weight
- Rewards that have a romantic association, like magic weapons or gold, appear more valuable
- Rewards that are tied into the storyline of the game have an added impact
- Pay attention to timing and quantity of rewards, otherwise they can become meaningless

EverQuest: Addictive Game

- Psychologist Nick Yee studied reward/ punishment structure in EQ
- Believes EQs addictive power lies in a behavior theory advanced by B.F. Skinner, *Operant Conditioning:*
  - The frequency of performing a given behavior is directly linked to whether it is rewarded or punished

Skinner Box

- Rat in box with lever and food dispenser
- Fixed interval schedule: food comes out on fixed interval
- Fixed ratio schedule: food comes out every time rat presses lever fixed number of times
- Random ratio schedule: must press lever a randomly determined number of times
- Everquest is Random Ratio Schedule
- Gambling in Las Vegas?

Recognition

- Powerful type of reward
- Humans crave acknowledgement for achievements
- Examples: high scores, tournaments

Anticipation

- Useful for complex choices (random ratio schedule good for simple, repetitive game play)
- Closed versus mixed information structures – is all information available to player?
- Chess versus Warcraft II with Fog of War

Surprise

- Feel random to players, but in a good way
- Example: foot soldier versus ogre
  - Foot soldier: strikes for 1-5 HP, 10 HP
  - Ogre: strikes for 1-20 HP, 20 HP
- Chance that foot soldier will win
- Trick is to find right balance of surprise versus meaningful decisions

Progress

- Advertise milestones to player
- Reward after each accomplishment
- Providing a path for player gives a sense of achievement
- Be creative in finding way to represent progress to player
- Plan “mini-arcs” after which player encounters “memorable moment”

Fun Killers

- Micromanagement
- Stagnation
- Insurmountable Obstacles
- Arbitrary Events
- Predictable Paths

Micromanagement

- Tedious
- Boring
- Overwhelming
- Solutions for RTS
  - Command queuing
  - Formations
  - High-level strategies (defend, attack, patrol, etc.)

Stagnation

- Repetition
- balance of power (team up against player that is ahead)
- endless loop (caught in debt)
- no progress being made

Insurmountable Obstacles

- Perceived as being such by some percentage of gamers
- Adventure games

Arbitrary Events

- Frustrate user, especially if a negative event
- Zombie closets

Predictable Paths

- Don’t force user down one path if possible
- Create illusion of freedom