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# CGMB534 Game Design

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## *Chapter 11: Game Balancing*

# Objectives

- List qualities that characterize a balanced game
- Define a dominant strategy and discuss ways to avoid dominant strategies in player-versus-player and player-versus-environment games
- Know how to use the element of chance in a game so that player skill still ultimately determines the outcome of the game

# Objectives (Cont.)

- List strategies for making symmetric and asymmetric player-versus-player games fair
- List strategies for making player-versus-environment games fair
- Understand types of difficulty and explain ways to manage difficulty to maximize the player's enjoyment of the game

# Objectives (Cont.)

- Discuss the phenomenon of positive feedback and discuss ways to control positive feedback in the game
- Recognize qualities of unbalanced games such as stagnation and triviality and explain how they can be avoided
- List design methods that can make fine-tuning easier

# What Is a Balanced Game?

- A balanced game
  - Is fair to the player(s)
  - Is neither too easy nor too hard
  - Makes the skill of the player the most important factor in determining his success
- Concept of balance differs between PvP and PvE games

# What Is a Balanced Game? (Cont.)

- A well-balanced PvP or PvE game has the following characteristics:
  - It provides meaningful choices
    - It avoids dominant strategies
    - Each strategy must have a reasonable chance of producing victory
  - Player's skill must affect success
    - Role of chance should not be so great that player skill becomes irrelevant

# What Is a Balanced Game? (Cont.)

- Additional balance requirements for PvP
  - Players perceive the game to be fair
  - A player who falls behind should have opportunities to catch up
  - Game rarely ends in a stalemate
- Additional balance requirements for PvE
  - The player perceives the game to be fair
    - Definition of fairness is different—discussed later
  - Level of difficulty must be consistent

# Avoiding Dominant Strategies

- Dominant strategy is a strategy that reliably produces the best outcome a player may achieve, no matter what his opponent does
- Dominant strategies are undesirable because a player has no reason to use any other strategy once she has discovered the dominant strategy

# Avoiding Dominant Strategies (Cont.)

- Dominant strategies in video games
  - Transitive relationships among three or more entities
    - If  $A > B$  and  $B > C$ , then  $A > C$ 
      - Never any reason to choose B or C if A is best
    - To correct the imbalance, assign costs to each choice
    - To create a more interesting choice, impose shadow costs for choices
    - Transitive relationships often used to create upgrades for a player's abilities—start with C and earn B, then A

# Avoiding Dominant Strategies

## (Cont.)

- Dominant strategies in video games (cont.)
  - Intransitive relationships (rock-paper-scissors)
    - If A beats B and B beats C, you can't assume A beats C
    - Rather, A beats B, B beats C, and C beats A
    - RPS model is simple but can be adjusted by modifying core mechanics
  - Orthogonal unit differentiation—each kind of unit should be unlike the others in a different dimension
    - Guarantees each kind of unit has a unique function

# Avoiding Dominant Strategies (Cont.)

- Dominant strategies in PvE games
  - Implementing fewer actions in a game risks creating exploits—actions that can beat any challenge
  - Test thoroughly to eliminate exploits

# The Role of Chance

- If chance plays a role, how to ensure the more skillful player wins?
  - Use chance sparingly
  - Use chance in frequent challenges with small risks and rewards
  - Allow player to choose actions
  - Allow player to choose how much to risk

# Making PvP Games Fair

- To balance symmetric games, treat every player the same
  - Same rules, resources, victory conditions
- Asymmetric games are harder to balance
  - Give players identical quantities of materials or points when they start
  - Players spend points to build units as they wish
  - Unit attributes should differ among players

# Making PvP Games Fair (Cont.)

- Balance issues for persistent worlds
  - Persistent worlds are never symmetric and always intrinsically unbalanced
  - New players need protection
  - Can be rebalanced on the fly by patching

# Making PvE Games Fair

- A fair PvE game should
  - Offer challenges at a consistent level of difficulty
  - Avoid learn-by-dying designs
  - Avoid stalemates
  - Provide information for critical decisions
  - Avoid requiring extrinsic information
  - Include challenges appropriate for the genre

# Managing Difficulty

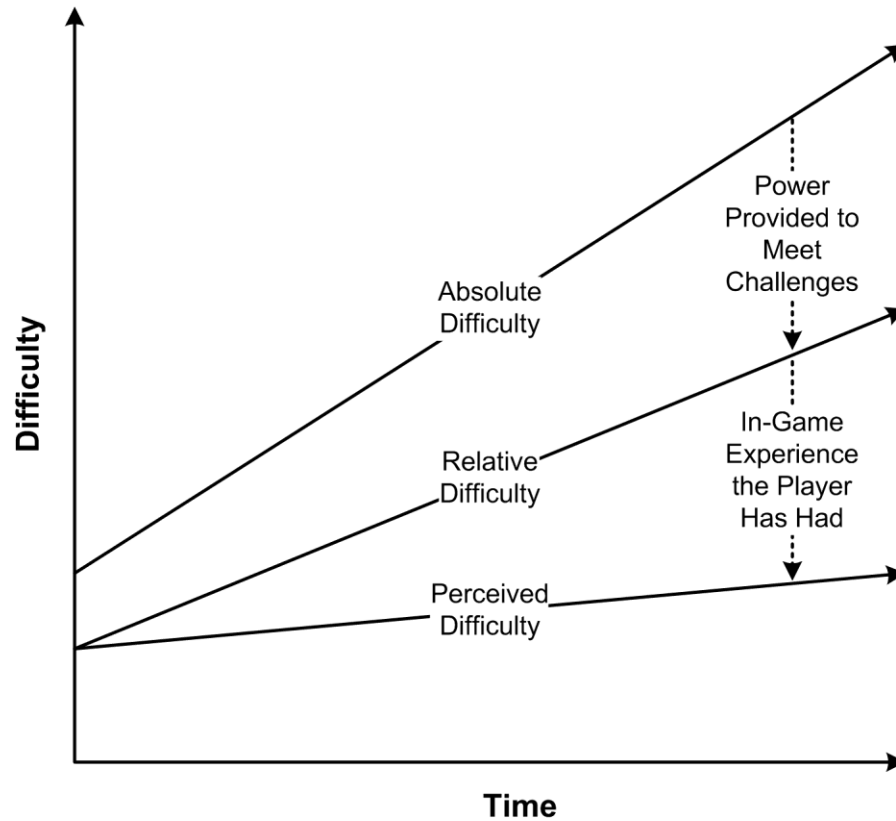
- Balancing a game includes managing the difficulty of its challenges to keep players within a flow state
- Factors outside the designer's control
  - Previous experience facing challenges similar to those in your game
  - Native talent such as hand-eye coordination and reasoning skills

# Managing Difficulty (Cont.)

## ■ Types of difficulty

- Absolute difficulty—compare amounts of skill required and stress to that of a similar trivial challenge
- Relative difficulty – difficulty relative to player's power provided by the game
  - Power provided measures player's strength by means appropriate to situation (e.g., weapon strength in shooters)
- Perceived difficulty = absolute difficulty – (power provided + in-game experience)

# Managing Difficulty (Cont.)



# Managing Difficulty (Cont.)

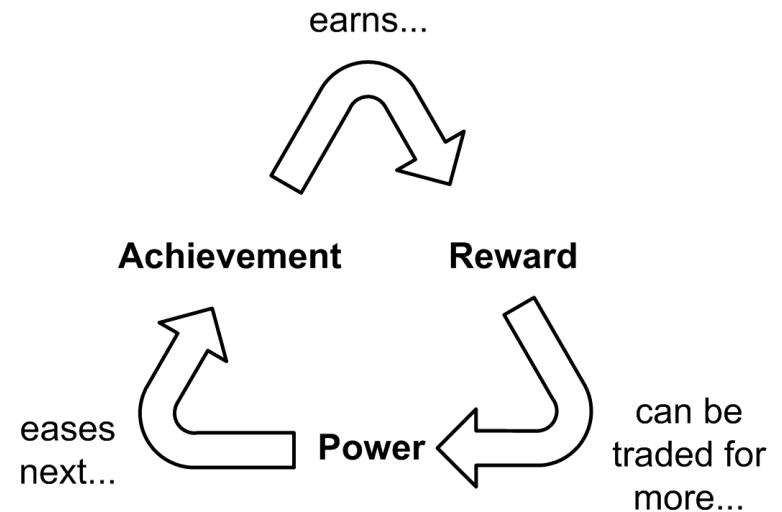
- Creating a difficulty progression
  - Perceived difficulty of challenges should stay the same or rise
    - In games for casual players and young children, it should remain almost flat
  - Relative difficulty must increase over time to counteract the player's growing in-game experience

# Managing Difficulty (Cont.)

- Establishing difficulty modes
  - In single-player games, allow player to choose a difficulty mode
  - When a difficulty mode is selected, challenges must stay within that range
  - If you can't adjust the difficulty of a challenge, provide a way around it for the easy mode and block the go-around route for the hard mode

# Understanding Positive Feedback

- Positive feedback occurs when a player's achievement changes the game state, making future achievements easier
- Benefits of positive feedback
  - Discourages a stalemate
  - Rewards success



# Understanding Positive Feedback (Cont.)

- Controlling positive feedback
  - Don't give too much power as a reward
  - Introduce negative feedback
  - Raise the absolute difficulty level of challenges as the player proceeds
  - Allow collusion against the leader
  - Define victory as unrelated to the feedback cycle
  - Use chance to reduce the size of the rewards

# Other Balance Considerations

## ■ Avoid stagnation

- Stagnation occurs when the player does not know what to do next
  - Hide clues in plain sight about how to proceed
  - Have the game detect when the player is wandering aimlessly and provide nudges in the right direction

## ■ Avoid trivialities

- Let the computer handle uninteresting details of game

# Design to Make Tuning Easy

- Generalize mechanics when possible
  - Try to avoid creating special cases
- Separate code and data
- Suggestions for efficient fine-tuning:
  - Modify only one parameter at a time
  - When modifying parameters, make big adjustments—the consequences are easier to see
  - Keep records
  - Use pseudo-random numbers

# Summary

- You should now understand
  - How to design a fair game
  - How to avoid dominant strategies
  - How to use chance
  - How to manage difficulty
  - How to control positive feedback