The Game Development Process

Game Design

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Outline

- The Creative Process
- Core Design
- Postmortems

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Nurturing the Creative Process

- Creativity is not intellectual anarchy
- Thoughts are associative – generate new ideas by combining others (picture of lattice of association)
  - Trick is to notice patterns in association
  - Say, similarity between *post office delivery* and *network traffic routing*
- Facilitate creative process
  - Stuff head with concepts and associations
    - Can't notice association between Post Office and Network Routing if don't know anything about either
  - How? *Read* (All great game designers?)

Based on Ch 7, *On Game Design*, by Chris Crawford

Nurturing the Creative Process - Read

- Make reading a lifelong process
- Broaden your reading
  - More than SciFi and Fantasy books
  - History, Religion, Politics, Culture
  - Game Design books
- Wonder as you read ("Why is the sky blue? Why do some coins have serrations on their edges?…")
  - Tightens up Web of associations
- Find answers to "wonders"
  - Once you find why sky is blue, will tell you why sunset is red (tightens associations further)
- Help build overall *creative foundation*

Based on Ch 7, *On Game Design*, by Chris Crawford

Nurturing the Creative Process – Play Games

- More than computer games – *board games*
  - Columbia Games, Avalon Hill, RPGs
  - Example: LOTR Confrontaion, Reiner Knizia
- Even computer games, *broaden*
  - Pick titles you would not otherwise play
  - Like FPS games? Fine. But try different genres
  - Become a "student" of games. Learn from them.
  - Bargain bin, even, maybe not great games but maybe great ideas

Nurturing the Creative Process – Sources of Inspiration

- Perhaps games not as broad as film
  - Shoot 'em ups like "Alien"
  - RPG's like "D&D"
  - Safe: "It's like Medal of Honor but in Desert Storm" … how creative is that?
- Draw upon wide range of sources for inspiration
  - Opera, Movies with subtitles, Random lectures, scuba diving … anything to remove *stale thinking*
- Originality in gameplay, story, setting, interface …
  - Freshness to one, great game
  - Freshness to all, new genre!
- Stephen King – originality when put familiar together in unexpected ways
  - Ex: vampire in pirate setting (turns to shark)

Based on Ch 1, *Game Architecture and Design*, by Rollings and Morris

Nurturing the Creative Process - Brainstorm

- Brainstorming has been much studied, and there have been found some common elements
- Intense emotional involvement
  - *Care* about problem
- Creator struggles, mightily, but fails
- Quiescent period, creator is distracted
- Finally, brainstorm itself and solution leaps to forefront
  - It may even seem obvious at that time

Based on Ch 7, *On Game Design*, by Chris Crawford

Having the Idea

- "How many industries can claim to deal in daydreams?"
  - Dreams are where every game begins
- With an idea, don't implement or tie down to technology
- "Genius is 1% inspiration, 99% perspiration" – Edison
  - Enjoy the 1% because everything else is hard work
- Think of many raw ideas to throw into game
  - May come up with hybrid
  - Look at what can contribute to others so get emergent game

Based on Ch 1, *Game Architecture and Design*, by Rollings and Morris

Nurturing the Creative Process – Growing the Idea

- Most ideas shouldn't grow further
  - Just because it is a creative idea, does not mean it is a good one
- Be aggressive at this point in your own mind in ripping into your own idea
  - Others soon will, so you should first
- Then, when pushing the idea (to, say, a publisher) through to a concept, make sure can "protect", perhaps with partner politically skilled

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The Creative Process – The Beginning

- Once you have an idea
  - Is it really good?
  - Worth spending time and money on?
  - Even if "rehash" should bring improvement to original and new challenges
  - Discuss with someone that can appreciate the idea

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The Creative Process – Define the Product

- Consider target audience
- Gather feedback from colleagues
- Think about core objectives
- List the challenges
  - Will help determine genre
- Determine how player will interface
- Define unique features, essential to gameplay
  - Has features been done before? If not, is there a reason why not?
- Consider theme (not graphical theme)
- Solidify in two- to three-page document

Based on pages 233+, *Gameplay and Design*, by Kevin Oxland

The Creative Process – Involving Others

- Never design by committee
  - "The only useful document ever designed by a committee is the constitution"
  - But blend of "like-minded" people can be very effective
- Meet with team with one-pager
- Keep early meetings focused on design and not on technical
- Write all ideas down, may come in handy later
- Incorporate changes into 2-3 page document
- Move on to *Concept Document*

Based on pages 233+, *Gameplay and Design*, by Kevin Oxland

Outline

- The Creative Process
- Core Design   (next)
- Postmortems

Core Design

- Brief, since overlaps material in
  - IMGD 1000. Critical Studies of Interactive Media and Games
- Topics
  - What is a Game   (Overmars + Ch2)
  - Gameplay   (Ch 3)
  - Interactivity   (Ch 3)
  - Game Balance   (Ch 5)
  - Look and Feel   (Ch 6)

Based on *Game Architecture and Design*, by Rollings and Morris

What is a Game? (1 of 3)

- Movie? (why not?)
  - → no *interaction*, outcome fixed)
- Toy? (why not?)
  - → no *goal*, but still fun)
- Puzzle? (goal + interaction ... why not?)
  - → strategy and outcome is the *same* each time
- Definition:

  "A computer game is a software program in which one or more players make decisions through the control of game objects and resources, in pursuit of a goal."

Based on *Tutorial: What is a Good Game?*, by Mark Overmars

What is a Game (2 of 3)

- A Computer Game is a Software Program
  - Not a board game or sports
  - Lose: 1) *physical pieces*, 2) *social interaction*
  - Gain: 1) *real-time*, 2) *more immerse*, 3) *more complexity*
  - Ex: chess vs. soccer vs. warcraft
- A Computer Game involves Players
  - "No, Duh". But stress because *think* about audience. The game is not for *you* but for *them.*
  - Ex: complicated flight simulator but audience is beginner

Based on *Tutorial: What is a Good Game?*, by Mark Overmars

What is a Game (3 of 3)

- Playing a Game is About Making Decisions
  - Ex: what weapon to use, what resource to build
  - Can be frustrating if decision does not matter
  - Want good *gameplay* (next major topic)
- Playing a Game is About Control
  - Player wants to impact outcome
  - Uncontrolled sequences can still happen, but be sparing and make logical
  - Ex: *Riven* uses train system between worlds
- A Game Needs a Goal
  - Ex: Defeat Ganandorf in Zelda
  - Long games may have sub-goals
  - Ex: recover triforce, sword of power

Based on *Tutorial: What is a Good Game?*, by Mark Overmars

What a Game is Not (1 of 2)

- *A bunch of cool features*
  - Necessary, but not sufficient
  - May even detract, if not careful, by concentrating on features not game
- *A lot of fancy graphics*
  - Games need graphics just as hit movie needs special effect … but neither will save weak idea
  - Again, may detract
  - Game must work without fancy graphics
  - Suggestion: should be fun with simple objects

"When a designer is asked how his game is going to make a difference, I hope he … talks about gameplay, fun and creativity – as opposed to an answer that simply focuses on how good it looks" – Sid Meier *(Civilizations, Railroad Tycoon, Pirates)*

Based on Chapter 2, *Game Architecture and Design*, by Rollings and Morris

What a Game is Not (2 of 2)

- *A series of puzzles*
  - All games have them
  - But not gameplay in themselves
  - Puzzles are specific, game systems spawn more generic problems
- *An intriguing story*
  - Good story encourages immersion
  - But will mean nothing without gameplay
  - Example: Baldur's Gate, linear story. Going wrong way gets you killed. But not interactive. Interaction in world all leads to same end.

Based on Chapter 2, *Game Architecture and Design*, by Rollings and Morris

Games are Not Everything

- Most important … *is it fun?*
- Computers are good at interactivity
  - Allow for interactive fun
  - *Interactive Media* and Game Development ☺
- Examples:
  - *SimCity*
  - *Grim Fandango*, good visuals, story, etc. But need to do puzzles to proceed. Could have skipped to just watch story. Would still have been *fun* without game.

Core Design

- Brief, since overlaps material in
  - IMGD 1000. Critical Studies of Interactive Media and Games
- Topics
  - What is a Game (Overmars + Ch2)
  - Gameplay (Ch 3)
  - Game Balance (Ch 5)
  - Look and Feel (Ch 6)

Based on *Game Architecture and Design*, by Rollings and Morris

Overview of Gameplay

- *Game theory* – branch of economics in which systems governed by rules are mathematically analyzed to determine payoffs of various end points.
- *Gameplay* – collective strategies to reach end points
- Note, gameplay is not everything
  - Choice of car in GTA is not always about payoff, but about what is *fun*
  - Software doesn't have to have gameplay to be entertaining … consider SimCity
- No one expects gameplay in movies or plays
  - "Hey, where is the gameplay in Hamlet?"
  - Rule 1: It should be fun (entertainment)
  - Rule 2: It should be interactive (make use of computer, else perhaps use film)
  - Rule 3: It can have gameplay (but that is choice)

Based on Chapter 3, *Game Architecture and Design*, by Rollings and Morris

Gameplay Example (1 of 2)

- Adventure game: knight, dwarf, priest, thief
- During combat, knight and dwarf in front, thief fires arrows
- Priest casts spells (all cost the same)
  - E-bolts (do damage equal to sword)
  - Band-aids (heal equal to sword)
- Which to cast?
  - Ask: against single opponent (they are equal)
  - Ask: against opponent with 6 arms (bolts)
  - Ask: against many opponents with weak attacks (band-aids)
  - → Can always decide which is better
    - Not so interesting

Gameplay Example (2 of 2)

- Now, suppose
  - Band-aids still affect single target but e-bolts are area affect in radius
  - E-bolts do less damage, but armor doesn't make a difference
- Now, which to cast?
  - Answer isn't as easy. Interesting choices. Good gameplay.

> "A game is a series of interesting choices."
> - Sid Meier (pirates, civilization…)

Implementing Gameplay (1 of 2)

- Choices must be non-trivial, with upside and downside
  - If only upside, AI should take care of it
  - If only downside, no-one will ever use it
- Note, this is only regarding game theory
  - Ex: Could have ray gun that plays music. "Cool", but soon "gimme the BFG"
  - Ex: Nintendo's Smash Bro's has "Taunt" … ask: what for?
  - Ask: other examples from popular games?
- Gameplay value when upside and downside *and* payoff depends upon other factors
  - Ex: Rohan horsemen, but what if other player recruits pikemen?
  - Ex: Bazooka, but what if other player gets out of tank?

Based on Chapter 3, *Game Architecture and Design*, by Rollings and Morris

Implementing Gameplay (2 of 2)

- Should be *series* of interesting choices
  - Ex: Use of health potion now may depend upon whether have net for capturing more fairies
  - Having net may depend upon whether needed space for more arrows for bow
  - Needing arrows may depend upon whether killed all flying zombie bats yet
- Hence, well designed game should require *strategy*
- Game must display complexity
  - But doesn't mean it must be complex!
    - Don't make too many rules. Less if more.
    - Real world example: termites place one piece of mud. Results in hive, with cooling vents, etc.
  - *Emergence* from interaction of rules
    - Ex: Priests convert, but not if already in combat
    - Ask: examples from popular games?

Based on Chapter 3, *Game Architecture and Design*, by Rollings and Morris

The Dominant Strategy Problem

- Articles with "10 killer tactics" or "ultimate weapon"
  - Ask: what are these doing?
  - → Taking advantage of flaws in the game design!
- Should never have a option not worth using
  - *Dominated* strategy
- Should never have an option that is so good, it is never worth doing anything else
  - *Dominant* strategy

Near Dominance

- Worth looking for near dominance, too
  - *Near-dominated* – useful only very narrow circumstance
  - *Near-dominant* – used most of the time
- Ex: *stun gun* only useful against raptors, so only useful on raptor level (near dominated)
  - Do I want it used more often?
  - How much effort on this feature?
  - Should I put in lots of special effects?
- Ex: *flurry of blows* most useful attack (near dominant) by Monk
  - Should we spend extra time for effects?

Avoid Trivial Choices (1 of 2)

- Horsemen → Archers → Pikemen
  - *Transitive,* not so interesting
- Horsemen → Archers → Pikemen → Horsemen (picture)
  - Ask: what game does this look like? (rock-paper-scissors)
  - *Intransitive*, more interesting
  - Ex: from LOTR Battle for Middle Earth
    - Horsemen fast, get to archers quickly with lances
    - Pikemen spears hurt horsemen bad
    - Pikemen slow, so archers wail on them from afar

(Will look at *game balance* in depth, next topic)

Avoid Trivial Choices (2 of 2)

- A beats B, B beats C, C beats A. (could hardwire)
  - But could also have how *much* better
  1) Single horseman can beat any number of archers: Horseman → Archers (∞)
  2) Single horseman barely beat an archer: Horseman → Archers (1.1)
- Ask: Which is better?
  - Trick question! Both are bad
    Case 1) equal number of each, all others lose
    Case 2) doesn't matter which you choose
- Don't want to hardwire. Sometimes A way better than B, sometimes a bit better, sometimes worse
  - The answer should depend upon the game situation, weather, terrain, time … also what opponent is doing

Environment + Rules = Gameplay

- Battle of Hastings, 1066 A.D.

- King Harold tired, mostly infantry
- Duke William more archers, cavalry
  - Archers beat slower infantry → game over
- Not quite … Harold on hill (arrows less effective) and defensive mode
  - Archers tire → game over
- Not quite … William also smart, cavalry approach, but retreat. Infantry break ranks since they are frustrated, charge
  - Arrows now shred Infantry → Harold loses, game over
- Point: ways to change balance between different troop types. "A good commander isn't the one with the best army; he is the one who knows how to use it best"

Based on Chapter 3, *Game Architecture and Design*, by Rollings and Morris

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Ensuring Interesting Choices (1 of 3)

- Ex: *Elite* (early '80s, ask: who played?)
  - Accumulate wealth by trading
  - When 1000 credits, trade lazer for better lazer and have 400 left over for trading. No brainer. Always a win.
  - What if could buy lazer with 600? Then no credits left over. Decision is tougher.
- Point: keep difficult choices in hands of player
- Ask: other examples?

Based on Chapter 3, *Game Architecture and Design*, by Rollings and Morris

Ensuring Interesting Choices (2 of 3)

- Kinds of choices in gameplay can involve options:
    1) Should sometimes be taken, sometimes not
    2) Timing is critical and depends upon context (upgrade armor or build more troops)
    3) Makes little difference whether taken or not
    4) Always worth taking (target nearest)
    5) Never worth taking (remove armor, pay guy for tapestry in Vici)
- First and Second most interesting
- Third valid, but really only "chrome"
- Fourth should be handled by AI
- Fifth should seriously consider removing

Ensuring Interesting Choices (3 of 3)

- Interesting choices require good judgment on the part of the player
    - Correct choice must vary with circumstances
- Aim as designer, ensure circumstances don't stagnate and have only one right way to win
- No method for finding "best" choices
    - That's where creativity comes in (art)
- Still, some tips …

Toolbox of Interesting Choices

- Strategic versus Tactical
- Supporting Investments
- Versatility
- Compensating Factors
- Impermanence
- Shadow Costs

Strategic versus Tactical (1 of 3)

- Strategic choices affect course of game over medium or long term
  - *Tactical* choices apply right *now*
  - Ex: build archers or swordsmen (strategic)
  - Ex: send archers or swordsmen to defend against invading force (tactical)
- Strategic choices have effect on tactical choices later
  - Ex: if don't build archers, can't use tactically later

Based on Chapter 3, *Game Architecture and Design*, by Rollings and Morris

Strategic versus Tactical (2 of 3)

- Ex: *StarCraft*
  - Strategic choice: 1) upgrade range of marines, 2) upgrade damage, or 3) research faster fire
  - Which to choose?
    - If armored foes, Protoss Zealot, more damage
    - If fast foes, Zerglings, maybe faster fire
  - Other factors: number of marines, terrain, on offense or defense

Strategic versus Tactical (3 of 3)

- Ex: *Warzone 2100* (ask: who played?)
  - Build factories to spawn war machines
  - If build in level, then spawn quickly but factory only used for that level
  - If build at base, spawn slowly (have to ship to front lines) but factory can be used in subsequent levels
- Lesson: Good gameplay should have different choices leading to different *kinds* of payoff
  - Reduces the risk of trivial choices
  - Increase scope for good judgment

Supporting Investments

- Often game has primary goal (ex: beat enemy) but secondary goals (ex: build farms for resources)
- Some expenditures directly impact primary goal (ex: hire soldier), while others indirect (ex: build farm) called *supporting investments*
- Primary goals are "one-removed"
    - Ex: improve weapons, build extra barracks
- Supporting goals are "two-removed"
    - Ex: build smithy can then improve weapons
    - Ex: research construction lets you build smithy and build barracks (two and three removed)
        - Most interesting since strategic
- Payoff will depend upon what opponents do

Versatility (1 of 2)

- Rule of thumb is to ask what is best and worst about choices:
    1) This move does most damage, but slowest
    2) This move is fastest, but makes defenseless
    3) This move best defense, but little damage
    4) This neither best nor worst, but most versatile
- Most should be best in some way
- Versatile good for
    - beginners
    - flexibility (against unpredictable or expert opponent)

Versatility (2 of 2)

- Ex: beam can mine asteroids and shoot enemies
  - Versatility makes it good choice
- Speed is common way for versatility
  - Don't make fast units best
- If a versatile unit is also cheapest and most powerful → no interesting choice

Compensating Factors

- Consider strategy game where all units impeded by some terrain
  - Ships can't go on land, tanks can't cross water, camel riders only in dessert
- Assume flying unit that can go anywhere (Ask: how to balance?)
  1) Make slow
  2) Make weak, easily destroyed
  3) Make low surveillance range (unrealistic)
  4) Make expensive
- Note, last choice common but uninteresting since doesn't change tactical use
- Choice should be clear to player. Don't make a gamble before they know.
  - Ex: pick troops (cold weather) then find in jungle

Impermanence (1 of 2)

- Some permanent (ex: you get to treasure first), others not (ex: I got storage near mine, but you can grab it off me)
- Another kind of compensating factor
- Can be used for interesting choices
  - Ex: choice of medium armor for rest of game or invulnerable for 30 seconds?
- Advantage (or disadvantages) can be impermanent in number of ways:

Impermanence (2 of 2)

- Can be destroyed (enchantments, ex: gratuitous violence)
- Can be stolen or converted (ex: threaten)
- Can be applied to something you don't always have (ex: goblin king)
- Certain number of uses (ex: three grenades, but grenade spamming)
- Last for some time (wears off)
- Common in games, but deserves special attention

Shadow Costs (1 of 2)

- In a game, continually presented with costs and trade-offs. But not all direct.
  - Ex: soliders for gold, but need armory first for weapons and barracks for soldiers
  - Called *shadow costs* for supporting investments
  - Can make flow chart mapping shadow costs
- Ex: Age of Empires
  - Wood and food. Food is inexhaustible, wood is finite

Shadow Costs (2 of 2)

- Ex: Age of Mythology, Charioteer
  - Costs 60 wood, 40 food and 40 seconds to spawn
  - Shadow costs vary over game
    - Early on, food and wood expensive, spawn doesn't matter
    - Mid-game, much food and wood, spawn makes it harder to pump out new units
    - End-game, no wood, spawn is priceless
- Use variability to add subtlety to game. Vary environment and vary shadow costs (ex: more trees)
  - Challenge for level designer
  - Expert players will appreciate

Review: Use Tools from Toolbox of Interesting Choices

- Strategic versus Tactical
- Supporting Investments
- Versatility
- Compensating Factors
- Impermanence
- Shadow Costs

- Use 1-2 in a game is about graduating from college. Discuss.

Synergies (1 of 2)

Synergies are interaction between different elements of player's strategies

- Positive Feedback
  - Economies of Scale – the more of one type, the better (ex: wizards draw strength from each other)
  - Economies of scope: advantage of combined arms (ex: trident and net, infantry and tanks)

- Negative Feedback
  - Diseconomies of scale – first is most useful, others less benefit
  - Diseconomies of scope – (ex: mixed troops go only as fast as slowest)

Synergies (2 of 2)

- Ideally, all go together at once, but can emphasize
  - Ex: Chess is a game of positive feedback
  - Small advantage early on, exploited to crushing advantage
- Game of negative feedback needs other ways to keep interesting
  - Ex: trench combat makes a "catch-up" factor, or as get far from base, supply long grows, game lasts a long time
  - Ex: *Super NES NBA Jam* – catch up setting
- Be aware of each

Final Word on Gameplay

- Need to make sure choices interact
  - Ex: no fun winning because out optimize guy on resource production
  - Ex: no fun if win if know right thing to do else lose → no game, just forgone conclusion
- Want choices to interact with choices of opponent, want it to *depend*

Interactivity versus Gameplay

- Gameplay is important because it allows you to take the experience someplace
- Ex: Kick the soccer ball around, practice headers, bicycle kicks, etc. (interactivity)
  - Play a game of soccer on the pitch (interactivity + gameplay)
- Gameplay without interactivity could be fun (ie-television), but would start wondering if time is better spent doing something else
- Interactivity is more important that gameplay
- Interactivity without gameplay can be fun
  - Ex: Black and White, Sims
- Interactivity is the heart and soul of entertainment software

Based on Chapter 3, *Game Architecture and Design*, by Rollings and Morris

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Kinds of Interactivity (1 of 2)

- Can interact in many ways – game designers sometimes restrict themselves to facts
  - Ex: if you hit w/BFG, do 50 points damage
- Think broadly. Player could potentially:
  - 1) Directly control characters (Ex: move Laura Croft)
  - 2) Affect world (Ex: make *Stronghold* guys "insane")
  - 3) Influence characters actions at one remove (Ex: give weapons, like Zeus to a hero)
  - 4) Influence at two removes (Ex: inspiration, like a Muse)
  - 5) Decide who to follow, rather than what to follow (Ex: observer mode)
  - 6) Select what parts are interesting and give more time to that (Ex: like a child with a bedtime story, Saahil and hero build up and powers)

Kinds of Interactivity (2 of 2)

- (Ask: others?)
- How many are done?
  - 1 most everything, 2 for changing difficulty
- Why can't say to computer "Hey, let's build up a big army before we fight" or "Don't attack me since I'm having fun building"
- Or, why can't you switch sides in a battle?
- Avoid making mutant versions of films, novels or even board games
  - Use imagination for interactivity

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Concentrate on "Why" not just "What"

- Doesn't have to be about what happens
  - Ex: ER. Noah Wylie with patient – does he … follow rules, give experimental drug, play basketball?
  - But … not only way to be interactive. Instead, follow Noah, switch to patient, go to other Dr., back to Noah (Learn about characters)
- Drama unfolds because of understanding of characters
  - True in non-interactive drama, so true in games, too
- Ex: D&D dungeon, series of rooms w/monsters. Much richer if "why" behind scenes. Why were dwarves there? Why did they die? How orcs break in?
- Goal of entertainment is to make audience care
  - Use interactivity as a way to powerful technique to help this

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  - What is a Game   (Overmars + Ch2)
  - Gameplay   (Ch 3)
  - Game Balance   (Ch 5)
  - Look and Feel   (Ch 6)

Game Balance - Introduction

- Beauty in balanced games
  - Like Rolls Royce or Ball Machine in Airport
- Game without balance often unsatisfying and wasted effort (parts not in balance not used, so wasted effort)
- Broadly, game balance includes:
  - Player-Player – advantage only in skill (can be luck, but should be equal to both)
  - Player-Gameplay – learning curve matched by reward
  - Gameplay-Gameplay – Composite longbow does twice damage, should cost twice $

Player/Player Balance (1 of 2)

- Ex: *Virtua Fighter* (ask: who has played?)
  - Say, Sarah Bryant beats Lion every time?
  - Does that mean unbalanced?
    - No, look more closely
- Suppose friend said could beat everyone as Sarah Bryant all the time. Would say "prove it"
  - Would only be a problem if beginner as Sarah always be expert as Lion
  - And if could choose characters? Sarah versus Sarah?

Based on Chapter 5, *Game Architecture and Design*, by Rollings and Morris

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Player/Player Balance (2 of 2)

- Allow to arrange victory by skill and judgment
- Avoid results mostly as stroke of luck
  - Right from the start or magnified as game progresses (ex: start close to gold mine)
- Simplest way is to have symmetry
  - Same weapons, maneuvers, hit points (sports do this)
  - (But note, not always the most interesting. Want different moves on fighters, say. More later.)

Based on Chapter 5, *Game Architecture and Design*, by Rollings and Morris

Symmetry - Example

- Two heroes square off for duel, poised in kung fu stance
- Hours pass. Days pass.
- Breeze comes by, spec of dust in one's eye
- Blinks, frowns then bows
- Know result without fight … tiny asymmetry enough to decide outcome
- If breeze or dust decided game, is that ok?
  - No … you'd want your money back!
- Don't want to decide by factors out of control
  - Keep symmetric

Symmetry

- Symmetry is fine in abstract games (ex: chess, even basketball)
- In realistic games, would be problem (ex: U.S. versus Iraqi game symmetry bothersome)
- While easy, kind of an insult
  - Ex: LOTR BfME Warg's same as horses … but Wargs can bite in book/movie!
- Better is functional symmetry that is not obvious

Symmetry in Level Design

- Can avoid obvious symmetry
  - Ex: each player has impassible region on flank (water or mountain range)
    - Knights and soldiers can't cross
    - Later on, advanced units can cross
    - Choice of unit depends upon barrier
      - Mountaineers to storm, ships to cross sea
      - Or bluff, and then go up middle
- Players can choose asymmetric start location
  - Should not be deciding factor (Ex: you choose downwind port, so you lose)
  - Avoiding making start location critical decision
  - Ex: potential mines in many spots, so not critical

Symmetry in Game Design (1 of 2)

- Make all choices for players functionally the same
  - Ex: *Warcraft 2* – humans have griffons and orcs have dragons; both flying toughies.
- But even slight differences make interesting
  - Ex: *Warcraft 2* – orc players runes explode, making use in mountain passes good
- "Just broken" asymmetry easier to manage than total asymmetry (can compensate)

Symmetry in Game Design (2 of 2)

- Making choices for players different, yet balanced is tougher
- Ex: *Starcraft*: Protoss, Zergs, Terrans – all very different
  - Imagine the hours of playtesting!
  - Recommend only for deep pockets
  - "Benchmark" against which to judge other RTS games
- Also, if re-creating historical simulation, tradeoff between fairness and authenticity
  - Ex: *Conquistadors vs. Aztecs* – Aztecs are doomed, but may be no fun. Certainly not symmetric

Based on Chapter 5, *Game Architecture and Design*, by Rollings and Morris

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Mini-Outline

- Broadly, game balance includes:
  - Player-Player
  - Player-Gameplay   (next)
  - Gameplay-Gameplay

Player/Gameplay Balance - Introduction

- Means remembering that the business is about interactivity – think about player's relationship to the game
  - Ex: If had to "tune" the T.V. every time channel surf, would not do it much
  - Likewise, should not struggle for small reward
- Ex: *Baldur's Gate* (ask: who's played?)
  - Attributes 3-18 (ask: why?), can re-roll if don't like. So, re-roll until all 18's. Ugh. Test of endurance!

Player/Gameplay Balance - Introduction

- Player/Gameplay balance entails balancing challenges against player's improvement curve
  - RPG's have monsters get tougher with level (but boring if that is all)
  - Want widening options, too
    - Ex: character gets more abilities
- Three rules
  1) Reward the player
  2) Let the machine do the work
  3) Make a game that you play with, not against

Reward the Player

- Player will have to learn. Will make mistakes (discouraging). Want to offset with reward when do something right
- Ex: *Virtua Fighter*, takes longer to learn complicated moves
  - Sarah's backflip. Reward comes from seeing flip (eye candy) and punch in kidneys (payoff)
- Best when expand game options
  - Ex: "Now with backflip, I can see new use for reverse punch"
- In general, better to reward player for something *right* than punish for something *wrong*

Let the Machine do the Work

- Interface should show player the world and let him/her manipulate
- Computer is tool to take care of wide-range of tedious tasks
  - If tasks are not fun, don't make player do them
- Blur of boundary between chore and game feature
  - RPG could provide graph so player can manually draw map as explore … but is that fun?
- Also, if game option is no-brainer, consider AI taking care of it

Make a Game that you Play With, Not Against

- Consider great story, graphics, immersion but only progress by trial and error ... is this fun?
- Ex: crossbowman guards exit
  - Drink potion. Sneak up. He shoots you. Back to save.
  - Run up and attack. He's too fast. Back to save.
  - Drop bottle. He comes looking. Shoots you. Back to save.
  - Drink potion. Drop bottle. He walks by you. You escape!
  - Lazy design!
- Should succeed by skill and judgment, not trial and error

Based on Chapter 5, *Game Architecture and Design*, by Rollings and Morris

Ex: The Save Game Problem

- Designer talking about RPG
  - "I've got a great trap!" ... platform goes down to room. Player thinks treasure but really flame throwers. Player is toast!
  - "What if player jumps off?"
  - Thinks it's a loophole ... "Ok, teleport in then toast"
  - "What is the solution?"
  - "There isn't one." (surprised) It's a killer trap. It will be fun.
  - "So, there's no clue for player? Charred remains on platform or something?"
  - "No. That's what the Save feature is for"

Based on Chapter 5, *Game Architecture and Design*, by Rollings and Morris

Save Points

- Should be used only so can go back to Real Lives™ in between game
- Don't design game around need to save
  - Has become norm for many games, but too bad
  - Ex: murderous level can only get by trying all combat options
- Beginner player should be able to reason and come up with answer
  - Challenges get tougher (more sophisticated reasoning) as player and game progress
  - But not trial and error

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Mini-Outline

- Broadly, game balance includes:
  - Player-Player
  - Player-Gameplay
  - Gameplay-Gameplay   (next)

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Gameplay/Gameplay Balance

- Challenges when balancing aspects of gameplay?
  - Want variety of interesting choices, rather than single, dominant choice
  - Best choices depend upon choices of other players (or AI)
  - Not easy to see how frequently different choices will be worth making, but need to know to balance game
- Sounds like catch-22? Can use simple concepts to make first guess
  - Then lots of play testing to fine tune! ☺

Component Balance

- Two levels to balancing: *component* and *attribute*
  - Talk about component first, attribute later
- Establish the value of each game choice
- For game balance, each choice must be reducible to simple value and factors must even out
- Ex: Pirate game
  - Dreadnoughts > Galleons > Brigantines
  - All have identical functions
  - If Dreadnoughts 2x powerful, then (for balance) Galleons should take $\frac{1}{2}$ time to spawn

What if Not Easily Reducible?

- Ex: *Starcraft*
  - Mutalisks fly over any terrain, but cannot fight other fliers
  - Wraiths are not as tough, but can attack other fliers
  - Observers can see enemy, but not fight
  - No expression for set value since different things
- Ex: Pirate game
  - Dreadnoughts slowest, Brigantines fastest
  - Interesting from gameplay, but what about balance?

Attribute Balance

- Involves not the relative values, but the way the choices interact
  - Ex: How important is ship speed relative to combat strength?
- Envision as a set, where relative values based on one factor only:
  - Speed: Brigantines > Galleons > Dreadnoughts
  - Tuffness: Dreadnoughts > Galleons > Brigantines
  - Range: …
- Can then combine to get average set combining all factors
- Then, adjust component values (often, through play testing) so all units are useful

Component versus Attribute Balance

- Mnemonic – component choices about artifacts
  - Ex: "Hmm. Should I use the ion cannon or laser?"
- Attribute choices are more abstract regarding use:
  - Ex: "I should sneak past troll or take extra health"
- Attribute balance harder (set of all problems)
- But if can get approximate picture of better strategies, can tweak costs to get balance

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Intransitive Game Mechanics (1 of 5)

	Rock	Paper	Scissors
Rock	0	-1	+1
Paper	+1	0	-1
Scissors	-1	+1	0

- Payoff, match your choice with opponent
- Suppose I always picked rock. Then opponent would notice and pick paper. Then I would start to always pick scissors, then…
  - spiral to center of triangle where all options equal
  - only break even, like thermodynamics

- Suppose scissors costs most, rock costs least
  - May use rock more often, scissors less
  - But wait, that would mean paper less useful, too… what is optimum choice now?
- Suppose scissors costs 3 ki, paper costs 2 ki, rock costs 1 ki and hit does 5 ki damage

	Rock	Paper	Scissors
Rock	0	-4	+7
Paper	+4	0	-4
Scissors	-7	+4	0

Ex: I choose scissors, you choose rock. Ki diff is –2.
Plus damage is –5, so –7 total.

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Intransitive Game Mechanics (3 of 5)

- Say payoff is R, P, S and frequency r, p, s
  - Want to know how often used (r, p, s)
- Net payoff R is $(0 \times r) + (-4 \times p) + (7 \times s)$
  1) $R = -4p + 7s$
  2) $P = 4r - 4s$
  3) $S = -7r + 4p$
- Sum must be zero (zero sum game, whatever one player gains other loses. Both cannot have net gain)
  - $R + P + S = 0$
- All costs must be equal else would favor (remember, triangle example)
  - $R = P = S = 0$

Based on Chapter 5, *Game Architecture and Design*, by Rollings and Morris

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Intransitive Game Mechanics (4 of 5)

- Solve: (3 equations in 3 unknowns)
  - (eq1) $-4p + 7s = 4r – 4s$ (eq2)
    - $11s = 4r + 4p \rightarrow s = (4r+4p) / 11$
  - (eq2) $0 = 4r – 4(4r+4p)/11$
    - $0 = 44r – 16r - 16p$
    - $0 = 28r - 16p \rightarrow p = (7/4)r$
  - (eq1) $0 = -4(7/4)r + 7s$
    - $0 = 7r + 7s$
    - $r = s$
- Ratio $\rightarrow$ r:p:s = 1 : 1.75 : 1
  - Rock and Scissors used 27%, Paper about 46%
  - Probably not what expected. Often result … if one option more expensive, others are most affected

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Intransitive Game Mechanics (5 of 5)

- Can use technique to adjust costs
  - Ex: if it turns out "too many" tanks relative to infrantry
- Enhance to more choices.
  - Ex: could do combination moves.
    - Rock + Scissors + Scissors = *Garden Shears*
    - Could be countered with *Paper Weight*
    - Strategy becomes complicated
- Fine, all is balanced. Players must avoid predictability because clever opponent will exploit.
  - But that is barely above where have only 1 choice!
- To balance so interesting, must have attribute factors that interact (remember, the Battle of Hastings)

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Other Intransitive Relationships

- Can extend RPS? Sure (otherwise not useful)
- More than 3 options → Table 5.3 and Case Study 5.5
- Less regular are 4 options → Table 5.4
- Figure 5.7 discusses another 4-way relationship
  - Infantry dominated
  - But, looking further, infantry only one that doesn't have to move
    - Can hold territory! (In game that needs that)
  - Ex: In AoE, could "teleport" supplies by building base. Didn't need to hold territory. Infantry useless. Even making them cost less doesn't (expansion pack). Still great game, but didn't need.

Based on Chapter 5, *Game Architecture and Design*, by Rollings and Morris

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Combinatorial Explosions

- How many attributes should there be to make interesting?
  - Too few? Then becomes trivial (Ex: in Hastings, only way to change power base is to put infantry on hill)
  - Too many? Then too hard to have skilled play
- Rule of thumb: N factors that could modify core mechanics, and each boolean (hill or not, rain or not …) → 2^N possible combinations … explodes rapidly
  - Err on the side of caution

"In Populous (EA god-game), should have lots of characters or half-dozen? Noticed would be easier to understand game experience with few, versatile units rather than many specific ones.

Richard Leinfellner, Exec in charge of Bullfrog

Based on Chapter 5, *Game Architecture and Design*, by Rollings and Morris

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Design Scalability

- Intransitive designs are inflexible
  - If have 5 way relationship and remove one, will have dominated strategy
  - Ex: RPS and remove R … always choose S
- If project lead says behind schedule, so don't include 5th orc type
  - Elegant design fall like a house of cards
- Relatively easy to add components
  - Doesn't have to be symmetrical, can be redundant or useful in only a few cases
    - Ex: scout, or special spell
- Lesson, if you are going to scale, scale up not down

A Game Balance Checklist (1 of 3)

- *Player-Player* – ensures game is fair. Increasingly important as multiplayer increases. Symmetry works for this, but asymmetry may be needed or more appealing (try "just broken"). Make sure any asymmetry doesn't magnify imbalance as game progresses.
- *Golden rule*: a player should never be put in an unwinnable situation through no fault of their own

A Game Balance Checklist (2 of 3)

- *Player-Game* – ensures player never becomes frustrated. Continually brings player back for more. Interface should not present obstacles. Small rewards are needed to guide player (fancy animation or new powers). Best rewards widen options.
- *Golden rule*: The game should be fun to learn as well as to play, and it should be *more* fun the more you master it

A Game Balance Checklist (3 of 3)

- *Gameplay-Gameplay* – makes sure no element redundant or useless. Can do briefly by making factor table for each attribute (fire, range …) Make sure each best at something. RPS ensures each component dynamically best rather than statically so. Oblige player to alter tactics. Don't have to have every component equally useful. But cost, availability and ease of use should reflect value. Get right through playtesting.
- *Golden rule*: all options in game must be worth using sometime, net cost of each option must be on par with payoff

Look and Feel

- Create a sense of alternate reality – *Immersion*

- Ambience
- Interface
- Storytelling

Ambience

- Everything that contributes to innate look and feel of game
  - Not just spiffy graphics - GLFOPS and trilinear filtering
  - Rather, *how* graphics are used
- Two fighters on bare stage. Fine. How about dirty street, realistic crowd hooting and hollering. Dark skies…
  - Ex: "Fiery hell" when battling boss in Battlegrounds
- Ambience is about providing background for story
- Broadly – Sound, Vision, Touch

Sound

- Wistful guitar in Diablo
- Ethnic rhythms in AoE
- Stirring call to arms in Warcraft
- Whimsical in Q'Bicles
- Best does ambience plus gameplay
  - Ex: Thief
    - "Come out taffer", looking for you
    - "Just a rat", you are safe
  - Ex: LOTR
    - "Stirring" music when level nearly over (but can still die!)

Based on Chapter 6, *Game Architecture and Design*, by Rollings and Morris

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Vision

- The "look" of the game
- Concept art
- Broad strokes, not pixel finished detail
- Rough sketches of characters or settings

- Paolo Piselli

Based on Chapter 6, *Game Architecture and Design*, by Rollings and Morris

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Vision Example

Concept Art

Movie

Touch

- Not really "touch", but physicality of games look and feel – *handling* of game
  - Ex: early animation characters did not move right – Disney pioneered with physical attributes that felt right, moved with weight
- Contrast
  - Ex: comic-book acrobatics in *Smash Bros*
  - Ex: bouncing vehicles in *Mario Kart*
  - Ex: realistic crashes in *Mid-town Madness*
  - Ex: super-players in *Lego Soccer*
  - Ex: realism in *Madden* (actually, guys 1.5 times faster)

Interface

- Ideal is transparent
  - Ex: LOTR BfME novel way when click expands with choices
  - Ex: Status can be in formation or appearance (not health hit-points, say)
- Doesn't have to be invisible
  - Ex: racing game expects dash
  - Ex: flight sim interface can look like cockpit
  - Ex: less is more (small square more annoying than framing with interface)
- Can enhance look and feel

Storytelling

- No need of story? After all, supposed to be *interactive*.
  - "If you want to tell a story, write a book."
  - Bah. Consider "choose your own adventure"
- Ex: Doom – two factions
  1) Strong setting and backstory enhance game
  2) "Story? We don't need no stinking story!"
     - Action takes care of itself
- Interactive can help user create story
  - Ex: *Half-life*
- Stronger – want to suspend disbelief of user but need to make them *want* to suspend
  - Ex: Starwars merely some sword fights and vehicle chases. Need to know who Luke is, why he's in the spaceship. Why the battle …

Toolbox of Storytelling Techniques

- Best → not chunks of action with static facts
- Details revealed to audience – let them figure it out
- Get emotional involvement from audience
- Storytellers knew tricks for creating good stories long before Shakespeare – Game Designers should employ
  - Obstacles, Plot Points, Foreshadowing …
  - (More next)

Obstacles

- Old man runs to hero in inn. Says "Vampire on hill. You have to kill it."
  - Poor
- Old man enters inn. Avoids hero. Purchases crucifix from another. Mumbles "you better have one if you are in these parts."
  - Not great, but better. Has obstacle
- Viewer must find out himself/herself
- "Tricked" into level of acceptance not obtained if just told, too artificial

Foreshadowing

- A story depicts the intrusion of the world on status quo
  - Ex: AoE – settlement grows to large city
  - Ex: Total Recall – construction worker spy
- *Foreshadowing* occurs early, before intrusion, hints at what is to come
  - Ex: AoE – small bandits come, fought off
  - Ex: Total Recall – dream of spy

Personalization

- Novice author – Ex: save the world, because big
  - But not compelling, so only *you* can save it
  - Still weak
- Need to add person reason so audience cares
  - Ex: you have two hours to save the world versus you have two hours to find your niece lost at sunset
  - Ex: Luke told must save galaxy. Why? Drawn in by personal (Princess Leia)
- Careful not to make personal hook in backstory – might skip

Resistance

- Back of mind saying "it isn't true"
  - Need to pull them along
- Ex: Bruce Willis, drinking at dingy strip club. Two suits say "you must save president from terrorist." Does he jump up and get to work? No. Snarls "I'm retired." Takes another drink.
  - We want him to change his mind. Rooting for him before main character does.

Plot Points (1 of 2)

- Importance of confounding expectations
  - Ex: Gandalf on quest to Mount Doom. Boring if that is exactly what happens
    - Gets killed early on (and comes back), not expected
- Adventure games benefit most, but can do for other games, too
- Aristotle – reversal, discovery, calamity
  - Ex: trying to save kid, causing her death (reversal)
  - Ex: finding Swiss account number on victim (discovery)
  - Ex: bomb going off, killing hero (calamity)

Plot Points (2 of 2)

- Games, too.
  - Ex: strategy game – find cliff so army built up won't work (reversal)
  - Ex: tunnel for small commando force (discovery)
- *Whammo* every 10 minutes, turn story in different direction
  - Big ones ("Luke, I am your father") divide into levels or acts
- Movies - setup, conflict, resolution
  - But games whole season (40 hours), not one movie
  - Best if can integrate in game without cut-scenes
- Early plot points deepen mystery, later clear it up (not always completely)
- Overarching structure, hierarchical in plot points

Suspense

- Ex: Unbeatable foe (Gorgon, only beat by lure to trap). With "save game" let hero try. After 9 times, try something else.
  - Death of lead character destroys illusion
- Instead, provide clues, suspense. Bodies, rotting, see NPC get eaten. Hear sounds. Can see gorgon survive rock crash.

Dialog

- One picture worth a thousand words
  - Don't have needless dialog when visual will do
- Good dialog serves more than one purpose
  - Ex: telling about bomb. "How long?" Plenty of time … smoke cigarette, call mom … don't read War and Peace. Reminds of mortality.
- Don't tell what know, but also reveal
  - "Do you expect me to talk?"
  - "No, Mr. Bond, I expect you to die"
- Surprise

Resolution

- Should be:
  - Hard won – no reward is satisfying if too easy (most computer games not this)
  - Not obvious – don't want ending one been seeing for 10 hours (yet should still make sense looking back)
  - Satisfying – usually morally (hero wins) but could be aesthetically (tragedy)
  - Consistent – with character, style development
  - Achieve closure – resolve story
- Many examples of stories/games where above fails
  - Diablo 2 – defeat Diablo … then 60 seconds to end.
  - Might and Magic 2 – long struggle, mystery. Very end, control panel … 15 minutes to decode "Fourscore and seven years …" Solved it, asteroid missed, thank you and go home
  - Ex: A Christmas Story – decoder ring drink Ovaltine

Change

- Stories set in interesting times
  - No "Sir Gawain shops for bread." Rather, "marries hag, one week until green knight chops head off"
  - Sometimes, return to normal
- Inner change is often point of story
  - No "Frodo lives in Shire with friends", rather "learns of evil, innocence to self-knowledge"

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What's Next?

- Art (2d, 3d, audio)
- Architecture
- Wrap up

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