Lecture 5

Rules and Mechanics
Today’s Lecture

• Reading is from Unit 2 of *Rules of Play*
  • Available from library as e-book
  • Linked to from the lecture page

• Not required, but excellent resource
  • Important for the serious designer
  • And ignore the Amazon reviews…

• The “Bible of Game Mechanics”
What are Rules?

- Definition from *Rules of Play*:
  - Rules are *formal schemas*

- But what does this really mean?

- Is it different for digital games?
Challenge of Defining Rules

- They do not need to be fixed
  - Example: Nomic (simulates democratic voting)
- But are changed in structured ways

- They can ignored
  - House-rules that add or remove rules
  - Rule relaxation (e.g. playing with a young child)

- They are not always explicit
  - Example: does Battlefield have rules on camping?
Implicit Rules

• We often consider these **social conventions**
  • If violate them, no one wants to play with you
  • Encapsulate being a “good sport”

• Implicit rules for Tic-Tac-Toe
  • Must move in a “reasonable” amount of time
  • If loss is inevitable, must move or forfeit

• These rules are generally made **ad-hoc**
  • Make them explicit only if there is a problem
Implicit Rules in Digital Games

- Often implemented as terms of service
  - Rules against using mods, bots
  - Rules against play-style (e.g. camping)

- Depend upon context, and can change
  - Ranked vs. unranked in network play
  - Official vs. private game server

- Exist because cannot specify everything
  - Goal is to prevent customer “churn”
How to Design Good Rules

• Player must have *meaningful choices*
  • Player must be able to make decisions
  • System must respond in significant way

• **Bad Rules**: Guess heads or tails to pick a winner
  • All you can do is guess the answer
  • Has no significant effect on the outcome

• **Bad Rules**: Move pieces on board with no interaction
  • Actions have no meaning since pieces don’t interact
  • There are no victory conditions or even challenges
# Informal versus Formal Rules

<table>
<thead>
<tr>
<th>Informal</th>
<th>Formal</th>
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<tbody>
<tr>
<td>● Part of initial design process</td>
<td>● Part of implementation</td>
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<tr>
<td>● Focuses on how it looks</td>
<td>● Corresponds to code</td>
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<td>● Less concerned with code</td>
<td>● Defined at the frame level</td>
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<td>● Many span multiple frames</td>
<td>● Interactions link multiple animation frames together</td>
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- Goal: match informal design
  - Is behavior correct?
  - Is behavior expected?
Understanding Game State

• Many game state values are **spatial**
  • Represent location of a game **entity**
  • Also physical values like velocity, acceleration

• Entities act as containers for non-spatial values
  • Values that never change: **attributes**
  • Values that can change: **resources**

• Attributes, resources can be global as well
  • Though most mechanics are at entity level…
Actions Affecting Spatial State

• Typically we what we would call movement
  • Present in all but the most abstract games

• But there are many ways to implement
  • Direct movement of avatar (e.g. WASD)
  • Indirect movement of avatar (e.g. pathfinding)
  • Alter the environment (e.g. removing platforms)

• Area of much potential innovation
Altering the Environment

- Found in “physics” games
  - No direct control of avatar
  - Can only remove/add/move obstacles in environment
  - Movement is “natural”

- **Example**: *Screw the Nut*

- Physics is a rule system
  - Interaction, not action
  - Takes one state to another
  - Also one that is complex to understand/model
Innovating Avatar Movement

- 2D games move on 2-axes
  - Classic: left-right/up-down
  - Unless top-down game, one of these axes is restricted
- Is jump the only option?
  - Launcher/trajectory verbs
  - (Limited) teleportation
- **Example**: Knightmare Tower
  - Launcher-style game
  - Vertical movement is boosts gained from killing enemies
Environment AND Avatar

- Possible to split the verbs
  - Some for avatar movement
  - Others for environment
- Found in “drawing” games
  - Draw missing platforms
  - Avatar walks on platforms
  - **Ex:** Max & Magic Marker
- Innovate by limiting avatar
  - Move on single axis
  - Combine with environment
  - **Example:** Swindler
“Deep Gameplay”

- Want many ways to overcome challenges
  - **Example**: kill enemy or sneak past
  - If just one way, gameplay is “shallow”

- Shallow challenges hurt replayability
  - “Twitch” challenges become boring fast
  - Cerebral challenges solved by the walkthrough

- All games should have a **strategic** element
Strategy

- **Definition**: an elaborate sequence of steps
  - Action is the culmination of all the steps
  - Changing steps or order changes action

- Still allows for puzzle gameplay
  - Allow some *flexibility* in these solution steps
  - **Example**: Multiple solutions to Rubik’s Cube
  - **Example**: Time-rewind in *Braid*

- **Resources** are a common way to implement
Resources and Gameplay

- Resources are crucial to “combat” mechanics
  - Entities have resource values (e.g. health, ammo)
  - Expend resources to affect others (e.g. attack)
  - May change resources of that entity (e.g. damage)
- Three basic categories of resource combat
  - **Tug-Of-War**: entities take from each other
  - **Dot Eating**: entities race to gather *limited* resource
  - **Flower Picking**: race to gather *unlimited* resource
Resources and the Game Economy

- **Sources**: How a resource can increase
  - **Examples**: ammunition clips, health packs

- **Drains**: How a resource can decrease
  - **Examples**: firing weapon, player damage

- **Converters**: Changes one resource to another
  - **Example**: vendors, *Starcraft* barracks

- **Traders**: Exchange resources between entities
  - Mainly (but not always) in multiplayer games
Economic Challenges

• You can use resources to
  • Control player progression (hinder or advance)
  • Modify player abilities (limit or enhance)
  • Create a large possibility space (for replay value)
  • Create strategic gameplay

• Do not need a lot of resources
  • Not every game is a strategy game
  • But almost all games have some economy
Resources as Dilemma

• Players perform cost-benefit analyses
  • **Cost**: resource change not beneficial to player
  • **Benefit**: resource change beneficial to player

• **Example**: Survival Horror
  • Use ammo to shoot zombie (**Cost**: ammo)
  • Use knife to stab zombie (**Cost**: health)
  • Benefit the same in each case

• Players act with least cost for benefit
Resources and Monetization

• Most resources are gathered in-game

• But some games allow external sources
  • Get resources from a friend on Facebook
  • Pay for resources with a credit card
  • Known as resource monetization

• Free-to-play, pay-for-stuff
  • Modern business model for online games
  • But BIG pushback right now (loot crates)
Emergent Behavior

**Coupled Interactions**
- Two mechanics that can happen at once
- **Verbs**: jump AND run in a platformer
- **Resources**: warrior AND archer in an RTS

**Context-dependent Interactions**
- Mechanics combine to give new behavior
- **Verbs**: jump and run is new form of movement
- **Resources**: warriors form wall to cover archers
Emergent Behavior

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Key Word

Advantage: game complexity grows **nonlinearly**
Examples of Emergent Actions

Running Jump
- Can move while in midair
  - Just horizontal movement
  - Not realistic; it is a game
  - Many platformer challenges assume this type of control
- Different than a long jump
  - Less height than reg. jump
  - No control once in the air
  - Would be a distinct action

Strafing Fire
- Based on “real life” property
  - Bullets travel in straight line
  - Movement changes origin
  - Walking side-side makes a spray (used in covering fire)
- But some features are gamy
  - Bullets slower than life
  - Character faster than life
  - Creates interesting effects
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Emergent Actions

Is this an example?

**Why** or **why not**?
## Common Spatial Interactions

### Collisions
- Can effect *resources*
  - Player takes damage
  - Player gains power-up
  - Player-NPC transfer gold
- Can effect *spatial values*
  - Bounce off collision point
  - Swing from attached rope
  - Attraction to magnet/charge

### Detection
- Examples:
  - Line-of-sight (w/ obstacles)
  - Spatial proximity
- Can have *direct* effects
  - Alarms in a stealth game
- Can have *indirect* effects
  - Tower defense targeting
  - Adjust NPC reactions

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Resource-Spatial Interactions

### Resource Affects Spatial
- Resources can unlock areas
  - Keys are a trivial resource
  - Also use resource thresholds
  - **Ex:** Collect all tokens to pass
- Resources affect difficulty
  - Adjust input device sensitivity
  - **Ex:** Deadeye meter in *RDR*
  - **Ex:** Jet packs to increase jump

### Spatial Affects Resources
- Resources made by entities
  - Have a spatial location
  - **Ex:** Time to transfer resources
  - **Ex:** Sources be captured
- Resource values are entities
  - Take up physical volume
  - Need space to acquire
  - **Ex:** Inventory in *Deux Ex*
Resource-Spatial Interactions

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Coupling is not Enough

- Example of *trivial* coupling:
  - RTS with single unit type – warrior
  - Coupling can arise from multiple warriors
  - When attack, count number on each side

- Group of warriors *is* sum of its parts
  - Just make a single warrior stronger
  - Discover from *resource analysis*

- Emergent behavior must couple *nonlinearly*
  - If \( n \) base mechanics, more than \( O(n) \) behaviors
Example: Starcraft

- Basic units can
  - Attack in sky and/or land
  - Defend in sky and/or land
  - How can these combine?

- Further complexity:
  - “Buff” friendly units
  - “Control” enemy units
  - How does this affect game?

- **Challenge**: What is minimal complexity for a good RTS?
Summary

- Rules are **formal systems** defining your game
  - Specify to change the game state over a single frame
  - Challenge is matching them to your informal design

- **Resources** create *strategic* gameplay
  - Resources define the game economy
  - Strategy is just players making economic choices

- **Interactions** facilitate *emergent behavior*
  - Coupled actions/interactions creating new features
  - Can provide deep, nonlinear complexity