Lecture 9

Gameplay Modeling
Next Week: Nondigital Prototype

- No software involved at all
  - Board game
  - Card game
  - Something different?

- Goal is to **model gameplay**
  - How? Nondigital/digital is very different
  - Model will be far removed from final result
  - What can we hope to learn from this?
Understanding Game Progression

- Level design about *progress*
  - Sense of closeness to goal
  - Choice of “paths” to goal *(dilemma challenge)*
  - Path choice can relate to play style and/or difficult
- Easier to design if *discrete*
  - Flow-chart out progression
  - Edges are mechanic(s)
- But game state values are *continuous* (sort of)
Discrete Progression

- Design is **discretization**
  - Impose flow chart on state
  - Each box is an **equivalence class** of game states

- **Spatial Discretization**
  - Contiguous zones
  - **Example**: past a doorway

- **Resource Discretization**
  - Range of resource values
  - **Example**: build threshold
Discretizing Spacial Locality

Prototyping
Discretizing Spacial Locality

Prototyping
Discretizing Spacial Locality

Paper Prototyping
Nature of Discretization

- State must be **unambiguous**
  - Must be an accurate, precise way to determine state
  - **Example**: string to measure distance in a wargame

- Actions must be **significant**
  - May correspond to several animation frames
  - **Example**: movement and attack in single turn

- Mechanics must have **compact interactions**
  - Avoid mechanics that depend on iterated interactions
  - **Example**: physics is *iterative* and hard to discretize
Discretization and Turns

- Discretization requires *turns*
  - Represent a unit of action
  - When done, game “at rest”

- Turns can be *multistep*
  - Multiple actions in a turn
  - Environmental interactions

- Turns can *alternate*
  - between other players
  - with a gamemaster
  - not at all (one player?)
A Single Turn in Squad Leader

1. Rally Phase
   • Damaged units heal/repair

2. Prep Fire Phase
   • Choose units to attack/fire
   • Cannot act in later phases

3. Movement Phase
   • Move units about the board

4. Defensive Fire Phase
   • Opponent (not you) acts
   • Fires on units that moved

5. Advancing Fire Phase
   • Moved units may now fire
   • Combat strength is reduced

6. Rout Phase
   • Damage units go for cover

7. Advance Phase
   • Move every unit one hex

8. Close Combat phase
   • Find enemies on your hexes
   • Units engage in combat
<table>
<thead>
<tr>
<th>Sequence</th>
<th>Description</th>
</tr>
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**Simulates (real-time) player reaction time**
Discretization and Reaction Time

- Allow opponent to **interrupt**
  - Action that reacts to yours
  - Played after you act, but before action takes an effect
  - Core mechanic in *Magic: TG*
- Make play **asynchronous**
  - Players still have turns
  - But take turns as fast as can
  - Conflicts resolved via speed
  - Often need a referee for aid
Reaction Time: Runaway Rails

- “Free runner” with coaster
  - Coaster can go faster/slower
  - Speed tests reaction time
- Model with hidden info
  - Cannot “process” all at once
  - Faster go, less screen to see
Reaction Time: *Runaway Rails*

Speed changes # of columns at each turn
What Can We Do Discretely?

• Evaluate emergent behavior
  • Allow player to commit simultaneous actions
  • Model interactions as “board elements”

• Model player cost-benefit analyses
  • Model all resources with sources and sinks
  • Focus on economic dilemma challenges

• Test player difficulty/usability
  • Ideal for puzzle games (or puzzle elements)
  • Can also evaluate unusual interfaces
Evaluating Emergent Behavior

• **Recall**: coupled, context-dependent interactions
  - Requires an action and interaction
  - Or (alternatively) multiple actions

• Model interactions as “board elements”
  - Rules to follow after your action
  - May follow several in succession
  - **Examples**: Chutes & Ladders, Bonkers, RoboRally
Interactions: RoboRally

- Player “programs” robot
  - Picks 5 movement cards
  - Committed to that choice
- After each card
  - Obey board elements in order
  - Check robot collisions
- Move = board elements + cards + collisions
Multiple Actions

- Necessary if have no interactions
  - Allow multiple actions in a turn
  - Typically needs complex turns

- Standard method: *action points*
  - Player has so many AP per turn
  - Actions cost AP to perform
  - Turn done when AP are all spent

- Might want other restrictions
  - Groups actions into types
  - Require types in certain order
  - **Example:** no attack after move
Cost-Benefit Analysis

• Where nondigital prototypes really shine
  • Resources are very easy to discretize
  • Economic choices easily map to turns
  • Understanding dilemma challenges is important

• Some believe this is *all* of game design
  • Claim everything can be reduced to a resource
  • Common in board game adaptations of other media
  • **Example**: balance game with instability resource
Cost-Benefit Analysis: Bounce

Jetpack expends oxygen (=health)
Tracking Oxygen as a Resource
Player Skill as a Resource

Game Grammar for PacMan

Resource Flow Legend:
- Pool
- Drain
- Gate
- Source

Game Over
Lives
Reset
Evade
50%
>100
>0
9

Game Grammars
Player Skill as a Resource

Game Grammar for PacMan

Resource Flow Legend:

- Pool
- Drain
- Gate
- Source

Game Over
Lives
Reset
Usability Analysis

- **Unusual user-interfaces**
  - Recall that actions correspond to inputs
  - Some inputs are not simple buttons
  - Example: touch gestures, motion controls

- **Puzzle-style games**
  - Create a game with module elements (e.g. cards)
  - Laying out levels creates a new game level
  - Allows you to quickly change and test levels
Usability Testing: Angry Bunny

Early Design:
Bunny movement controlled by battery “attraction”
Modeling Movement Controls

Strings attached at board corners

Control piece by pulling strings
Usability Testing: Reflexio

Touch zippers to open mouth

Can reflect world across various axes
Creating Puzzle Levels
Experiential Prototypes

• Some prototypes do not test gameplay
  • They test an experience or feeling
  • You determine if the feeling is enjoyable
  • Then go back and design gameplay for that

• *Discouraged* in this course
  • A very advanced design technique
  • Can easily end up with worthless prototype
  • Have only seen a few successes at this
Experiential Prototype: Aeronautical
The Experience of Threat

Gameplay Modeling
Most Important Thing: *Progression*

- Do not want a **one-level** game
  - Major problem with “flick” games in this course
  - Endless runners also have this problem

- We want some evidence of a **progression**
  - What is an easy level?
  - What is a medium level?
  - What is a hard level?

- Your prototype should be **reconfigurable**
Easy
Hard
The Difficulty Curve

Easy       Medium       Hard
Easy: Iridescence
Medium: Iridescence
Hard: Iridescence
Reconfigurable Prototypes
Summary

- Nondigital prototypes are about \textit{discretization}
  - Group continuous state into course groups
  - Simplify mechanics into discrete turns
  - Sometimes requires mechanics substitution

- They are ideal for \textit{early gameplay testing}
  - Evaluate emergent behavior
  - Model player cost-benefit analyses
  - Test player difficulty or usability
  - Capture player experiences (\textit{advanced})