Lecture 8

Prototyping
What is a Prototype?

- An *incomplete* model of your product
- Implements small subset of the final features
- Features chosen are the most important *now*

- Prototype helps you visualize *gameplay*
- Way for you to test a new game mechanic
- Allows you to tune mechanic parameters
- Can also test (some) user interfaces
What is a Prototype?

- A prototype helps you visualize **subsystems**
  - Custom lighting algorithms
  - Custom physics engine
  - Network communication layer

- Fits naturally with the SCRUM sprint
  - Identify the core mechanic/subsystem to test
  - Develop subsystem separately in sprint
  - If successful, integrate into main code
Types of Prototypes

- **Throwaway prototyping**
  - Prototype will be discarded after use
  - Often created with middleware/prototyping tool
  - Useful for *gameplay prototype*

- **Evolutionary Prototyping**
  - Robust prototype that is refined over time
  - Code eventually integrated into final product
  - Useful for your *technical prototype*
Case Study: Playing Fields

• Computer map aid for playing D&D
  • Provides a map grid for moving tokens about
  • Tools for creating tokens and images
  • Network support for a DM with many players
  • Intelligently obscures player visibility

• Motivation: lessen player “metagaming”
  • Physical map displays too much information
  • Playing over a network is a secondary concern
Case Study: Playing Fields
Gameplay Prototypes

- Focus on core mechanic (e.g. verb/interaction)
  - May want more than one for emergent behavior
  - But no more than 2 or 3 mechanics
  - Keep challenges very, very simple

- Prototype should allow *tuning on the fly*
  - Requiring a recompile to tune is inefficient
  - Use menus/input fields/keyboard commands
  - But do not make the UI too complicated either
Prototyping Playing Fields

• What are the core mechanics?
  • Moving a token about a grid
  • Using obstacles to block visibility

• Focuses on visibility and user control
  • Use a single token with fixed obstructions
  • Do not support network play
  • Do not worry about invalid moves

• Visibility distance is a tunable parameter
Playing Fields Prototype
Prototype: Lessons Learned

- Algorithm makes it difficult to see walls
  - May want unseen area a color other than black
  - May want to “fudge the edge of the boundary”

- Update algorithm does not support “strafing”
  - Vision is updated at start and beginning of move
  - Nothing “in between” is counted (e.g. alleys)

- Spacing of 50 pixels is optimal for viewing
Technical Prototyping

• Technical prototypes used for *subsystems*
  • Custom lighting algorithms
  • Custom physics engine
  • Network communication layer

• **Goal**: inspect inner workings of software
  • Features might be “invisible” in normal game
  • Specialized interface to visualize process

• **Not-a-Goal**: Make something fun
Case Study: Shadows and Lighting

- Recall gameplay prototype
  - Discrete shadows are easy
  - But had many problems
- Want something more robust
  - Continuously movement
  - Curved wall edges
  - Self-intersecting shadows
- Different features to test
  - Moving an avatar
  - Reconfiguring the wall
Case Study: Shadows and Lighting

- Recall gameplay prototype
  - Discrete shadows are easy
  - But had many problems

- Want something more robust
  - Continuously movement
  - Curved wall edges
  - Self-intersecting shadows

- Different features to test
  - Moving an avatar
  - Reconfiguring the wall
Case Study: Shadows and Lighting
Case Study: Agent Movement

- Artificial potential fields
  - Obstacles are repulsive charge
  - Goal is an attractive charge
  - Sum together to get velocity
- Fast real-time movement
  - No hard AI algorithms
  - But has other problems…
- Will cover later in class
  - See *Pathfinding* in schedule
Case Study: Agent Movement

Prototyping

Instructions:
To create a new vehicle, Control-click on its desired position. Use a regular click to select an existing vehicle for editing. A selected vehicle is indicated by a heavier border.

Only one vehicle may be selected at a time. A selected vehicle is pinned and will not move, but will still exert a force for avoidance.
Case Study: Agent Movement

- Make subsystem robust (evolutionary prototype)
- Make interface simple (throwaway prototype)
- Support controls to change parameters on fly
Case Study: Forgotten Sky

Prototyping
Nondigital Prototypes
Digital or Nondigital?

Digital Prototypes

- Advantages
  - Closer to final design
  - Input and control semantics
  - Great for complex systems (e.g. physics)

- Disadvantages
  - Shuts out non-programmers
  - Longer development time

Nondigital Prototypes

- Advantages
  - Fast to create, iterate design
  - Used by non-programmers
  - Great for resources and game economy

- Disadvantages
  - Input and player control
  - Complex systems
Lessons From Nondigital Prototypes

- 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

- Early user testing for player difficulty
  - Ideal for puzzle games (or puzzle element)
  - Can also evaluate unusual interfaces
Prototypes in this Class

- Required to demo three prototypes in class
  - **Nondigital prototype** week from Wednesday
  - **Gameplay prototype** on March 5th
  - **Technical prototype** on March 19th

- Nondigital prototype may be trickiest
  - Keep it simple; avoid a full game
  - Focus on dilemma challenges (e.g. choice)
  - More details in the next lecture
The Gameplay Prototype

- **Throw-away prototype**
  - Does not have to be in Java
  - Can use another language (e.g. C#)
  - Can use authoring tools (e.g. Flash, GameMaker)

- **Goal:** demonstrate gameplay
  - Challenges impossible in nondigital prototype
  - Basic player controls and interface
  - Primary game mechanic
The Technical Prototype

- **Evolutionary prototype**
  - Should be written in Java and LibGDX
  - Most of the code will be reused later
  - Some of code (e.g. interface) can be thrown away

- **Goal**: visualization and tuning
  - Simple interface displaying core functionality
  - Controls (e.g. sliders, console) to change parameters
  - Playtest to figure proper setting of parameters