the gamedesigninitiative at cornell university

Lecture 6

Nondigital Prototypes

Review: Prototypes

- 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

Software Prototypes

- **Gameplay Prototype** (2/25)
  - Throw-away prototype (not in final submission)
  - Does not have to be on device
  - Should demonstrate core gameplay
- **Technical Prototype** (3/9)
  - Evolutionary Prototype (part of final submission)
  - Should be on a device except in extreme cases
  - Should demonstrate important mobile challenge

Software Prototypes

- **Gameplay Prototype** (2/25)
  - Throw-away prot… …ission)
  - D…
  - Sh… …strate core gameplay
- **Technical Prototype** (3/9)
  - Evolutionary Prot… …mission)
  - Sh… …cases
  - Sh… …strate important mobile challenge

Vibe-coding can be great!

Vibe-coding = Technical debt

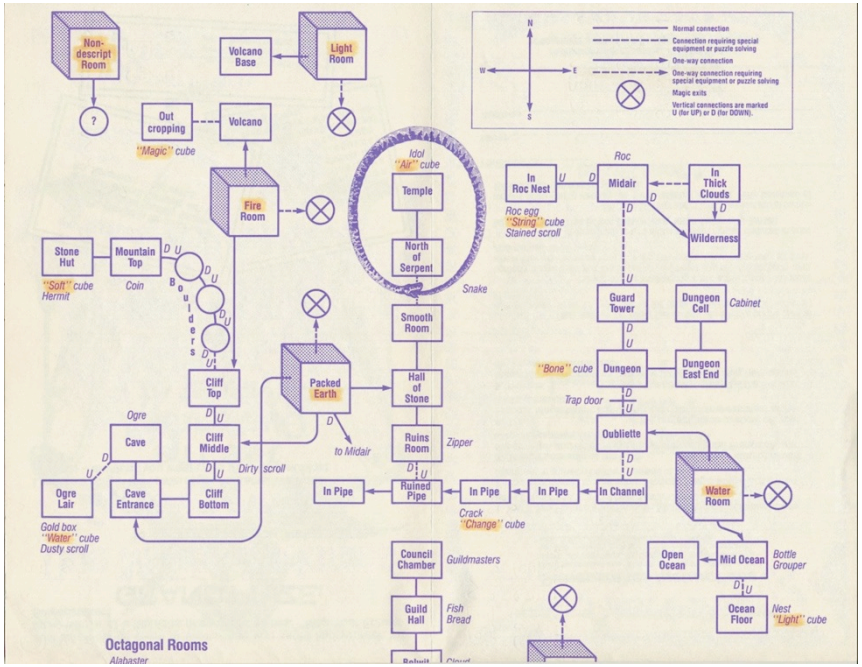
Next Week: Nondigital Prototype

- 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?

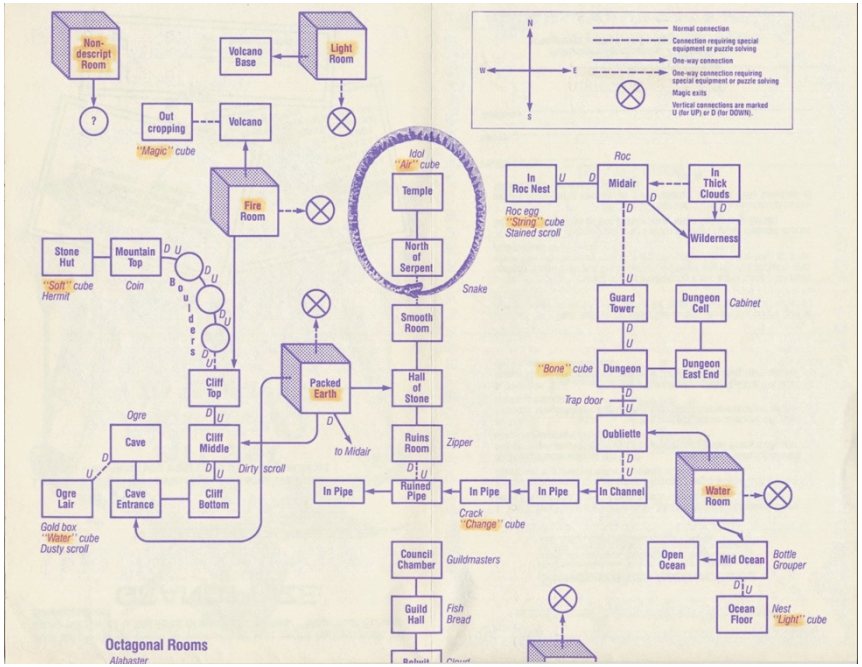
Understanding Game Progression

- 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)

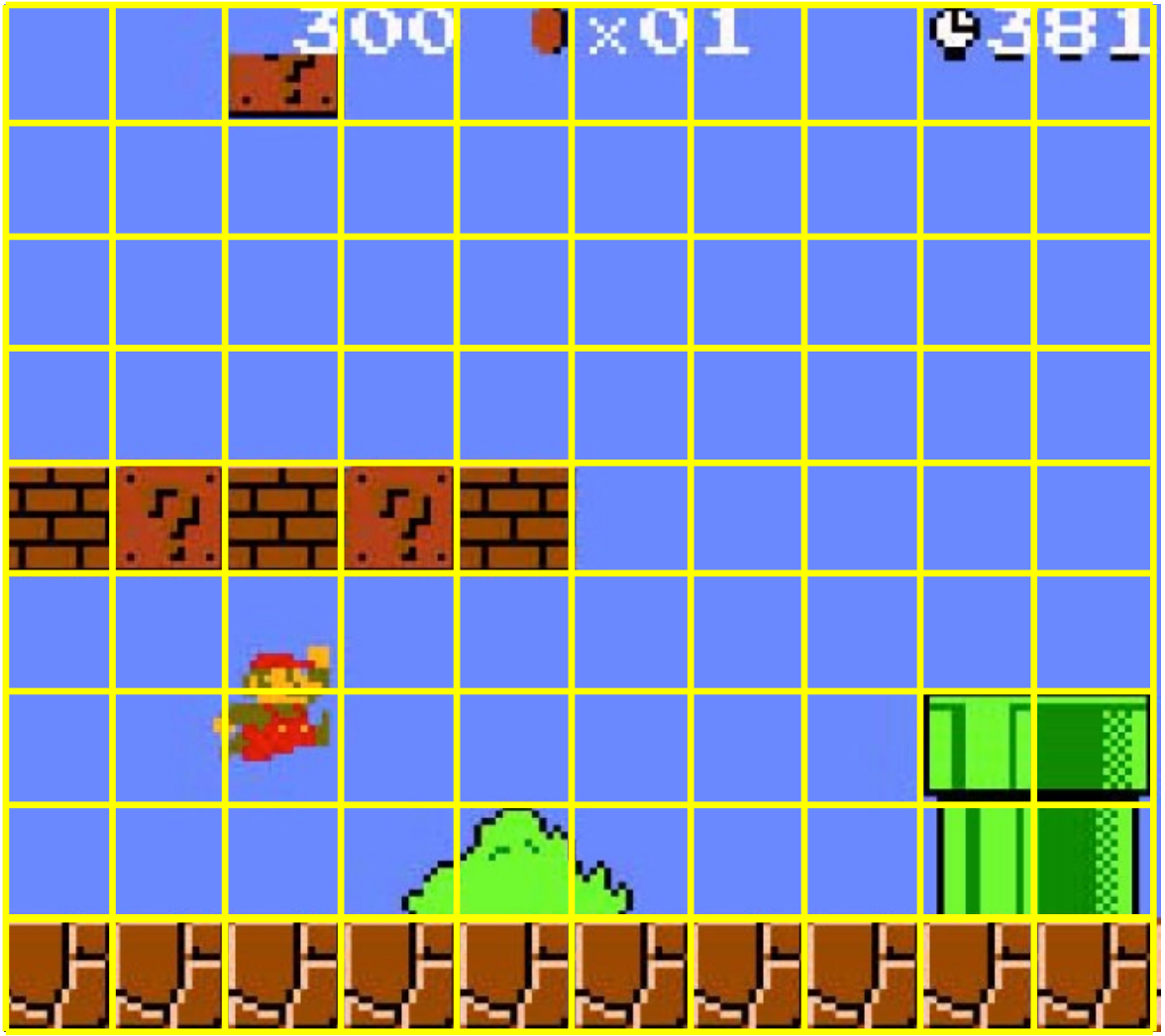


Discrete Progression

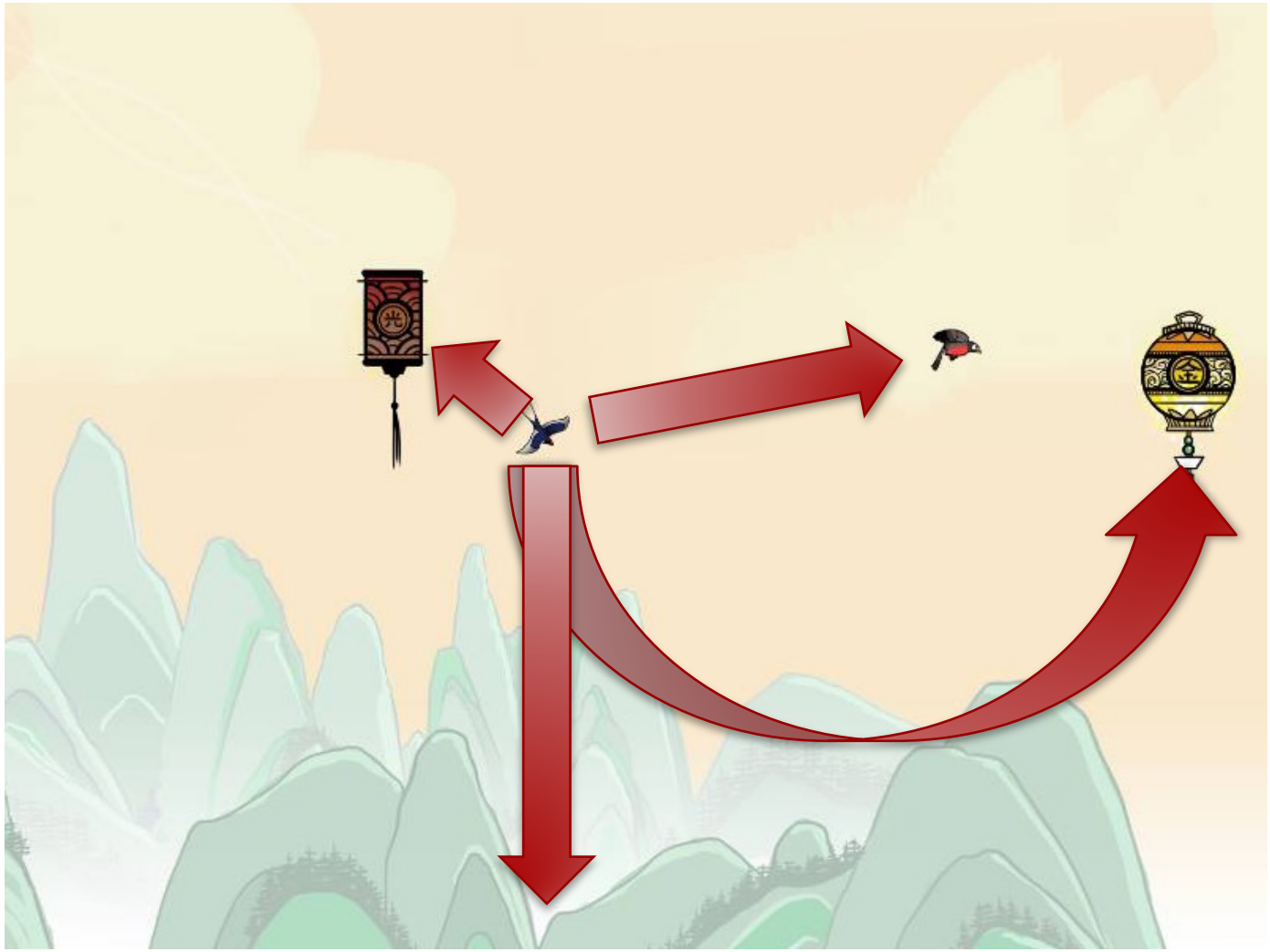
- Design is **discretization**
  - Impose flow chart on state
  - Each box is an equivalence class of game states
- **Spatial Discretization**
  - Contiguous zones
  - **Example**: past a doorway
- **Resource Discretization**
  - Range of resource values
  - **Example**: build threshold



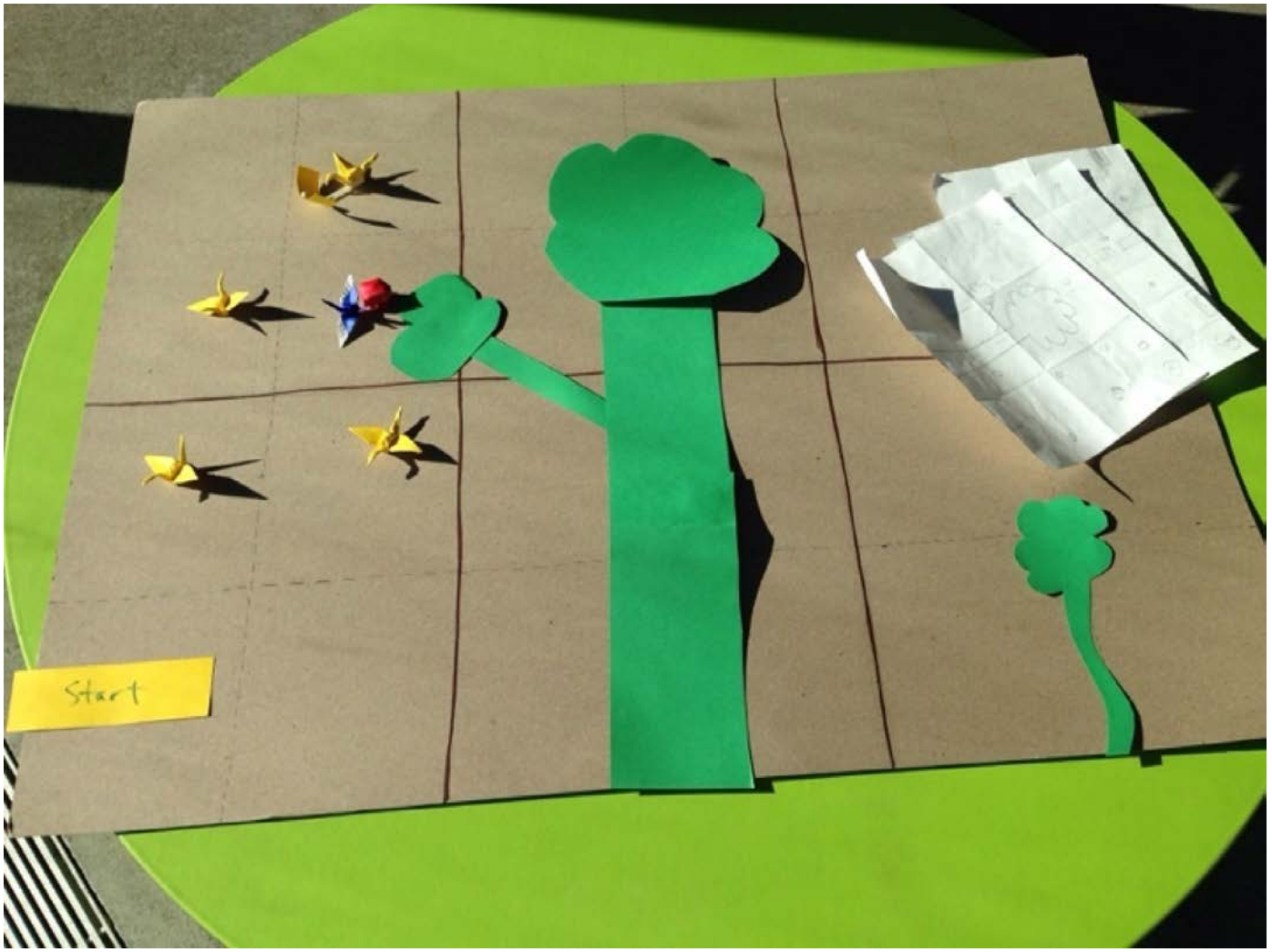
Spatial Discretization



Spatial Discretization



Spatial Discretization

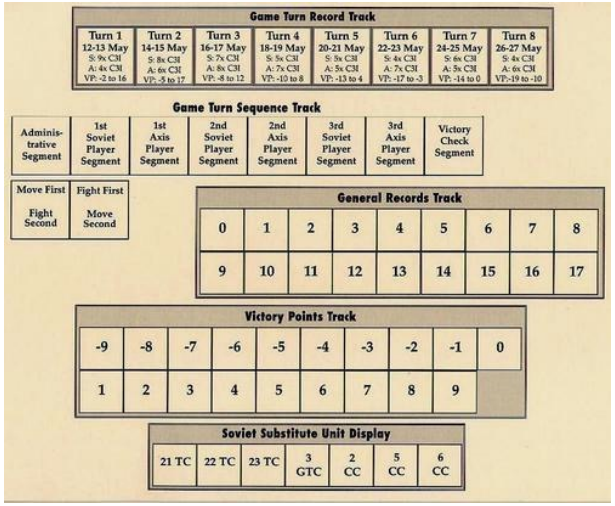


Nature of Discretization

- 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

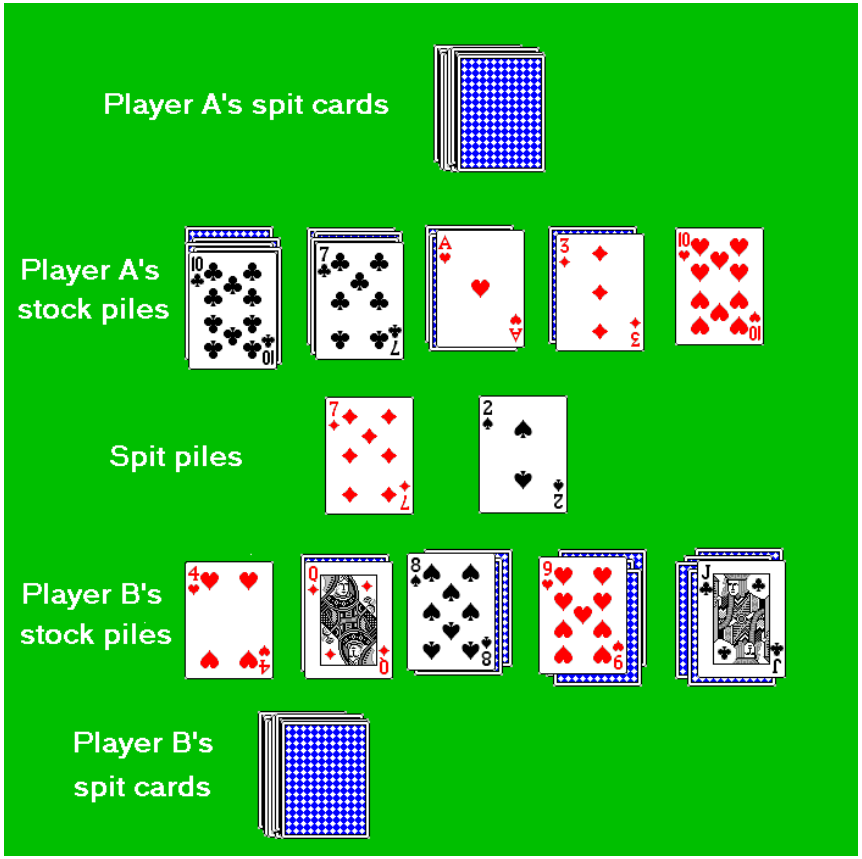
Discretization and Turns

- Discretization requires *turns*
  - Represent a unit of action
  - When done, game "at rest"
- Turns can be **multistep**
  - Multiple actions in a turn
  - Evironmental interactions
- Turns can **alternate**
  - between other players
  - with a gamemaster
  - not at all (one player?)

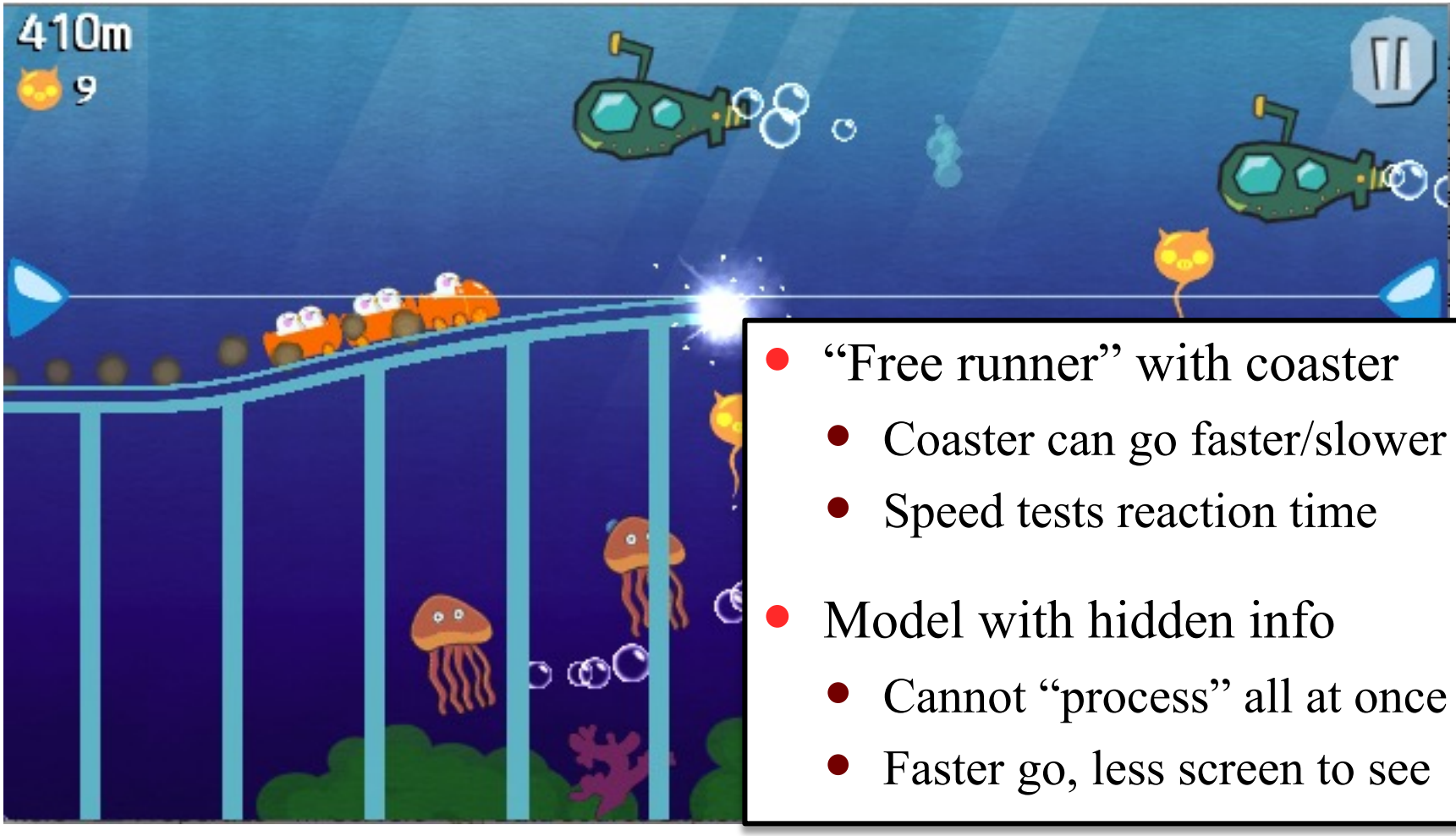


Discretization and Reaction Time

- 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

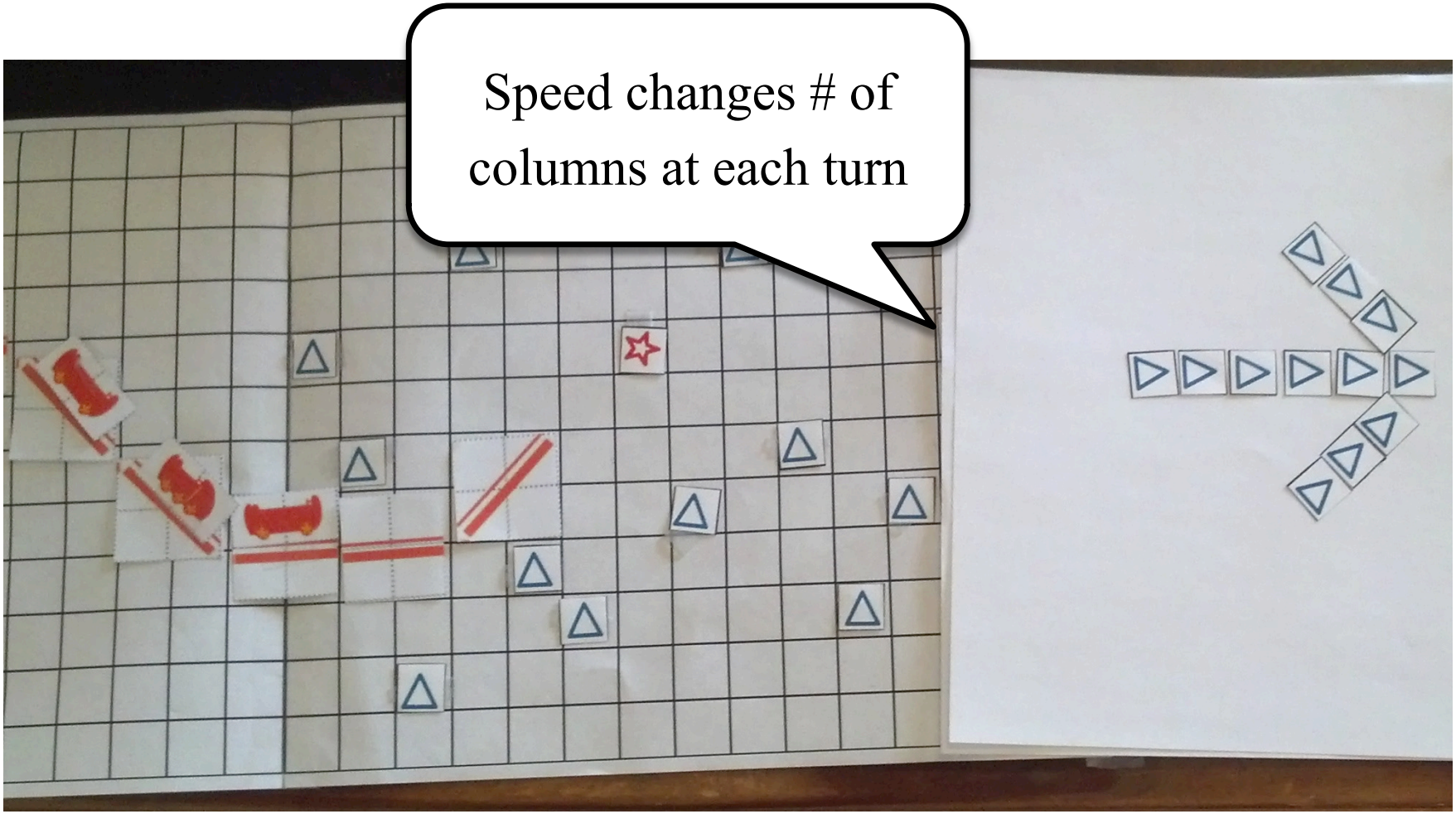


Case Study: *Runaway Rails*



- "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 as Hidden Information



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

What Can We Do Discretely?

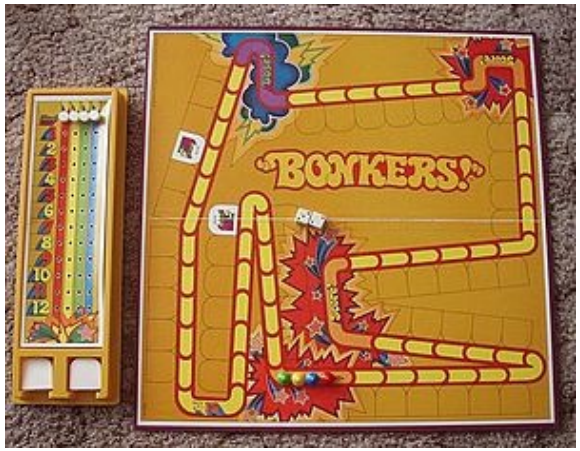
- **Evaluate emergent behavior**
  - Allow player to commit simult… …ons
  - Model interactions as "…
- **Model… …ent analyses**
  - Mod… …ources with sources and sinks
  - Focus on economic dilemma challenges
- **Test player difficulty/usability**
  - Ideal for puzzle games (or puzzle ele…
  - Can also evaluate unusual interfaces

Not that different from CS 3152

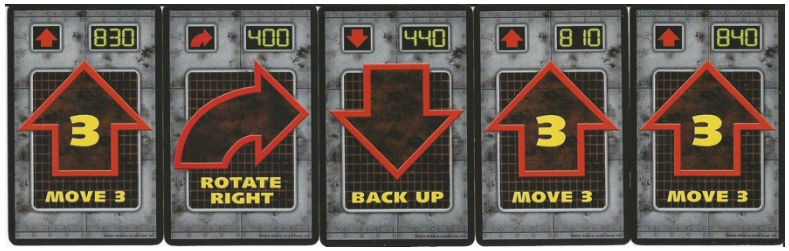
New issues for mobile games

Evaluating Emergent Behavior

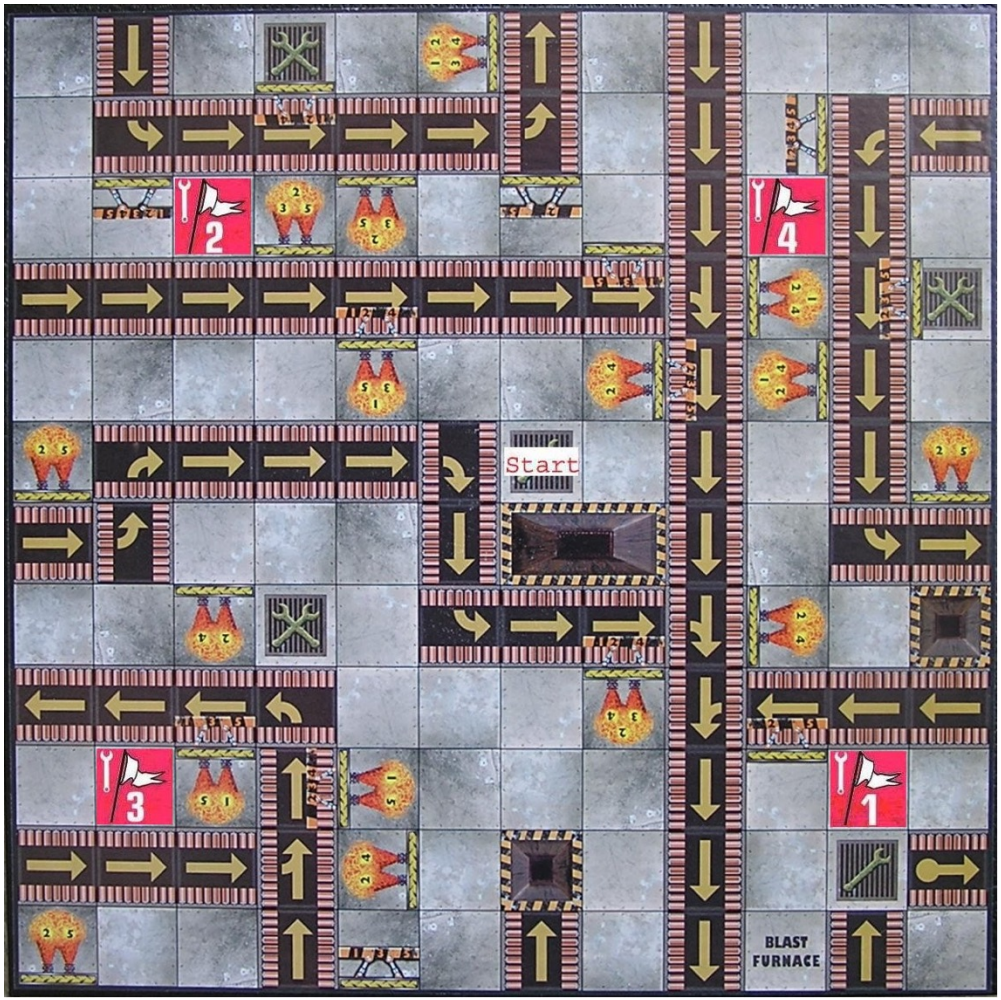
- **Recall**: coupled, context-dependent interactions
  - Requires an action and interaction
  - Or (alternatively) multiple actions
- Model interactions as "board elements"
  - Rules to follow after your action
  - May follow several in succession
  - **Examples**: *Chutes & Ladders*, *Bonkers, RoboRally*



Case Study: *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



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

Case Study: *Bounce*

Tracking Oxygen as a Resource

Case Study: *Trino*

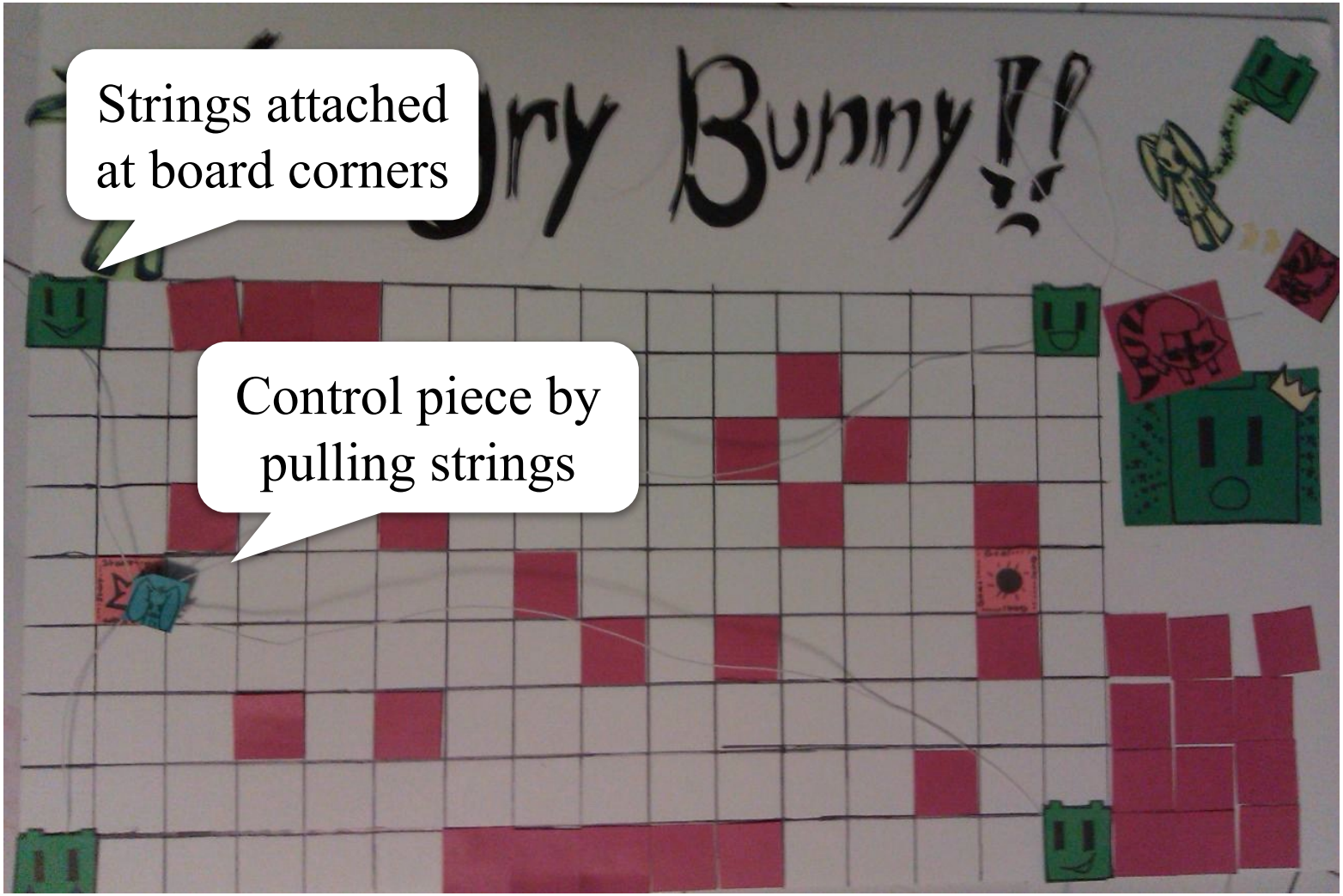
Measuring Shapeshifting Resources

Usability Analysis

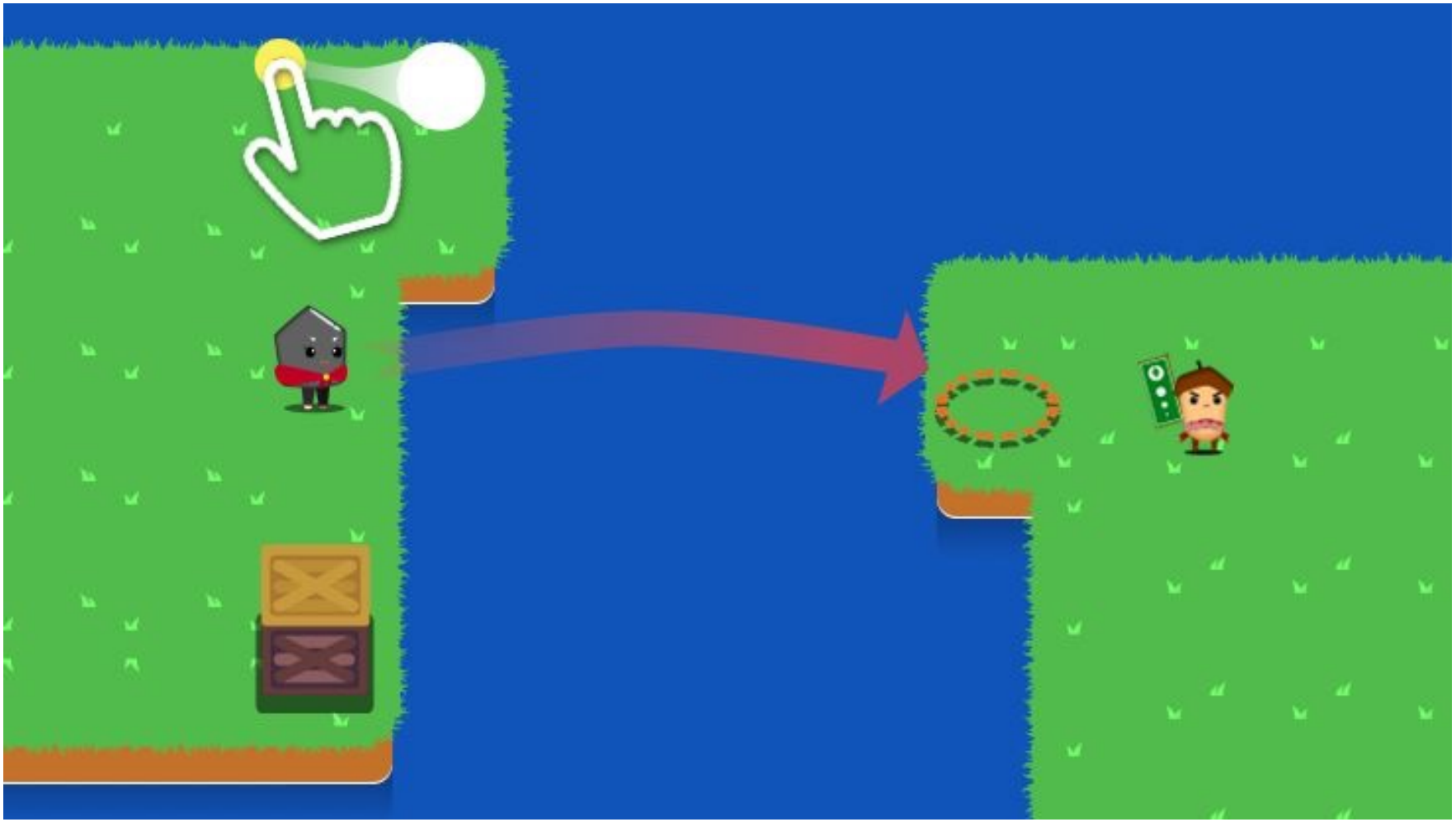
- **Unusual user-interfaces**
  - Recall that actions correspond to inputs
  - Some inputs are not simple buttons
  - Example: touch gestures, motion controls
- **Puzzle-style games**
  - Create a game with module elements (e.g. cards)
  - Laying out levels creates a new game level
  - Allows you to quickly change and test levels

Case Study: *Angry Bunny*

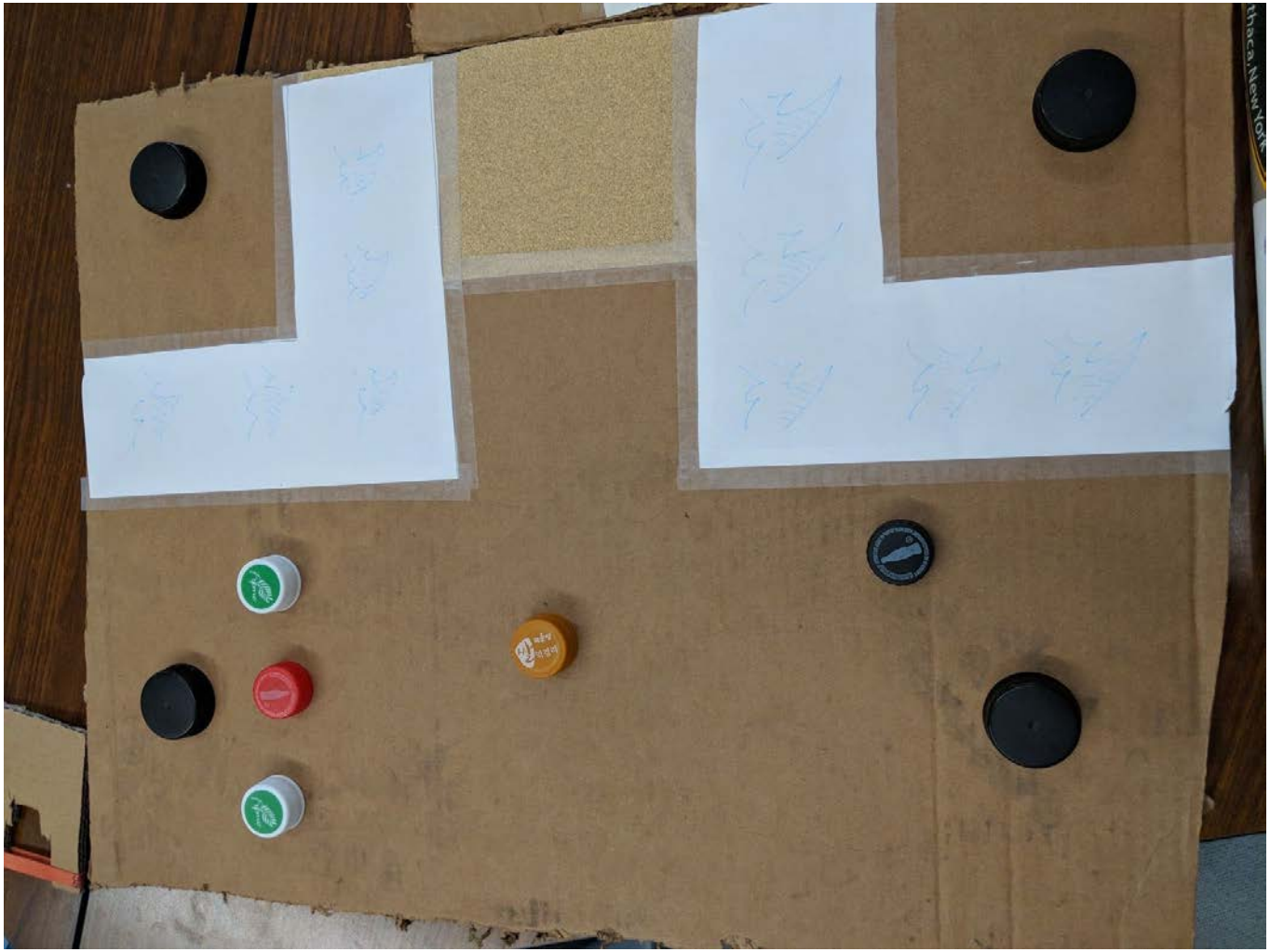
Modeling Movement Controls



Case Study: *Coalide*

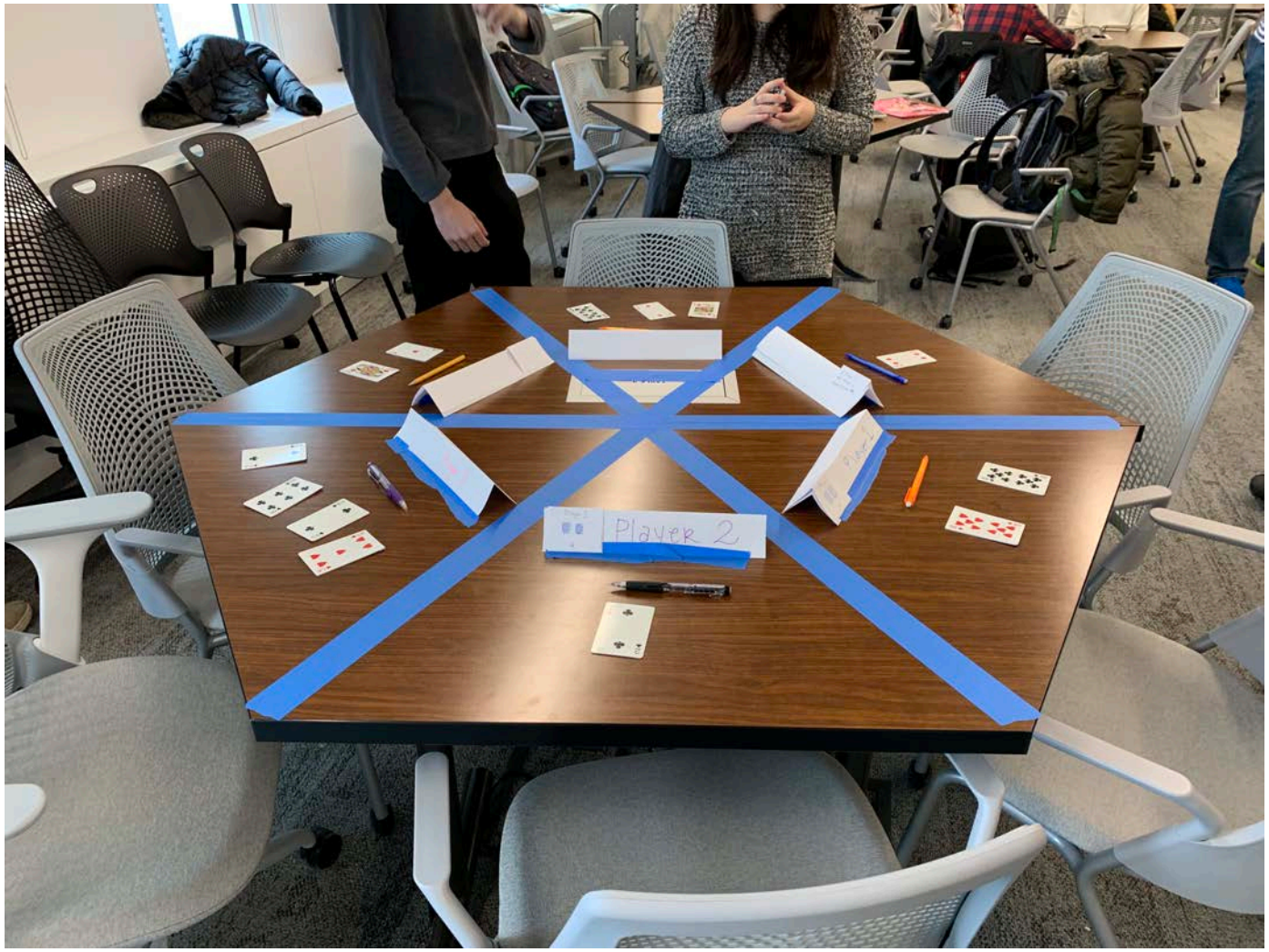


Modeling Flick Controls

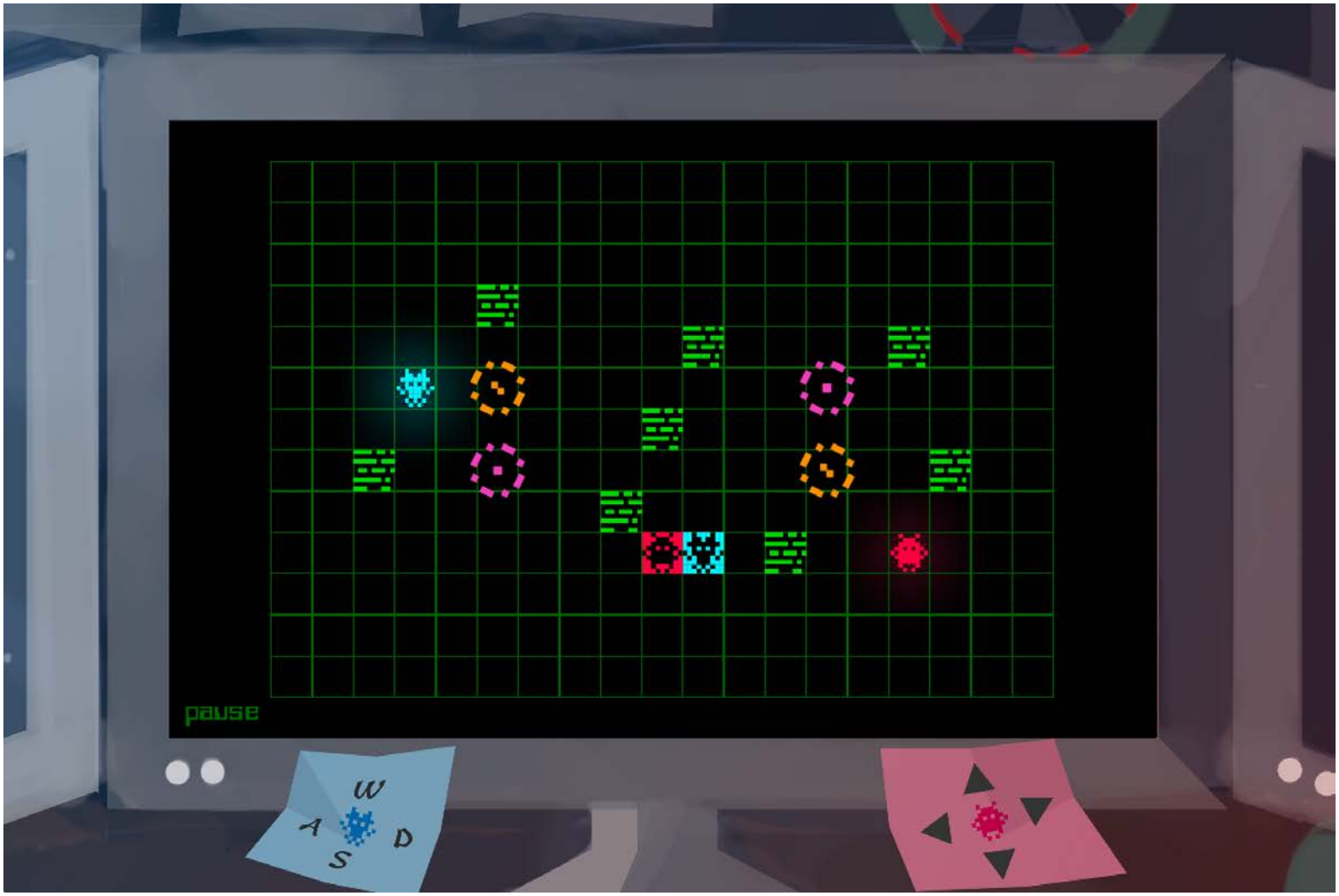


Case Study: *Family Style*

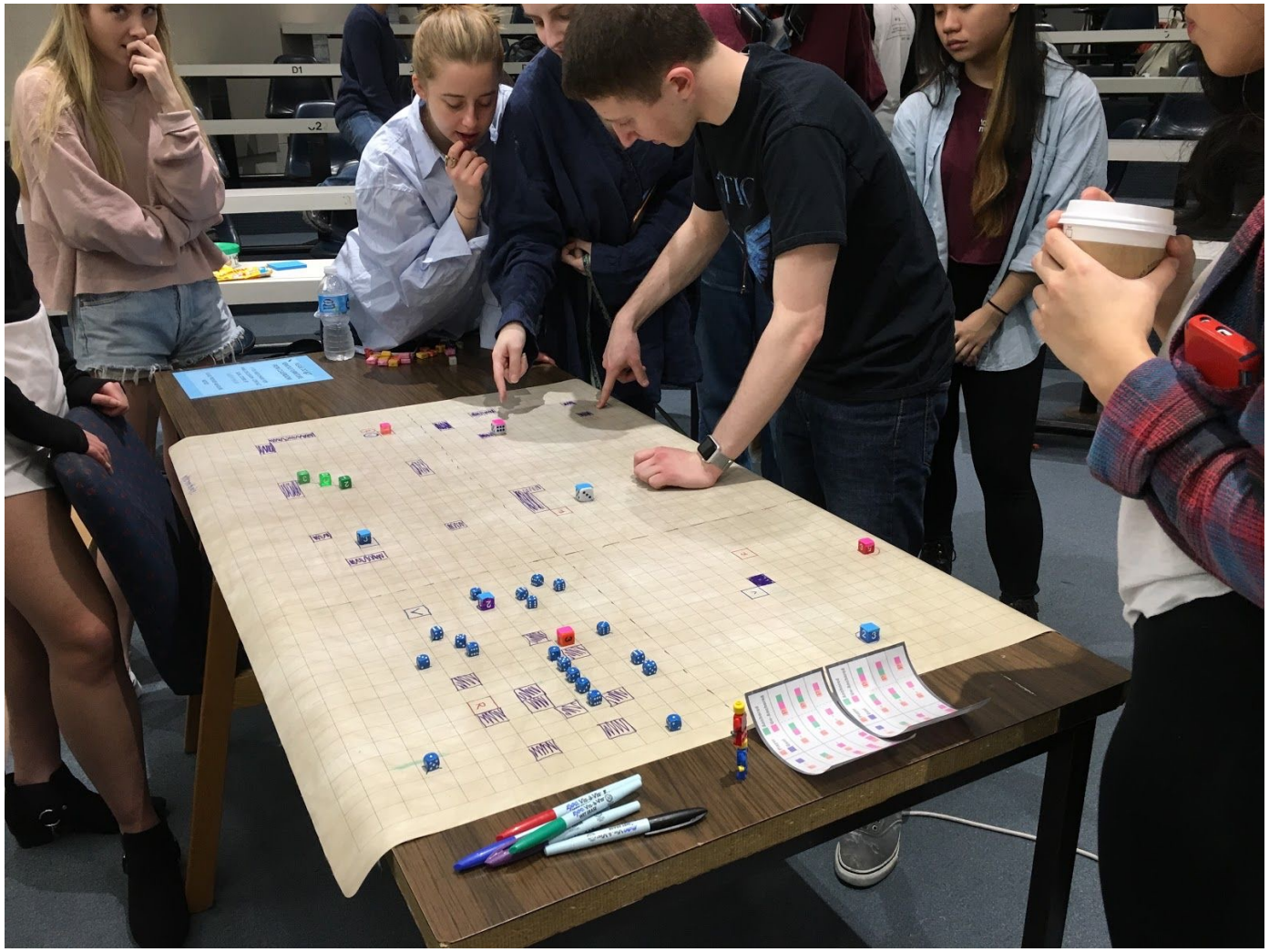
Modeling Multiplayer Restrictions



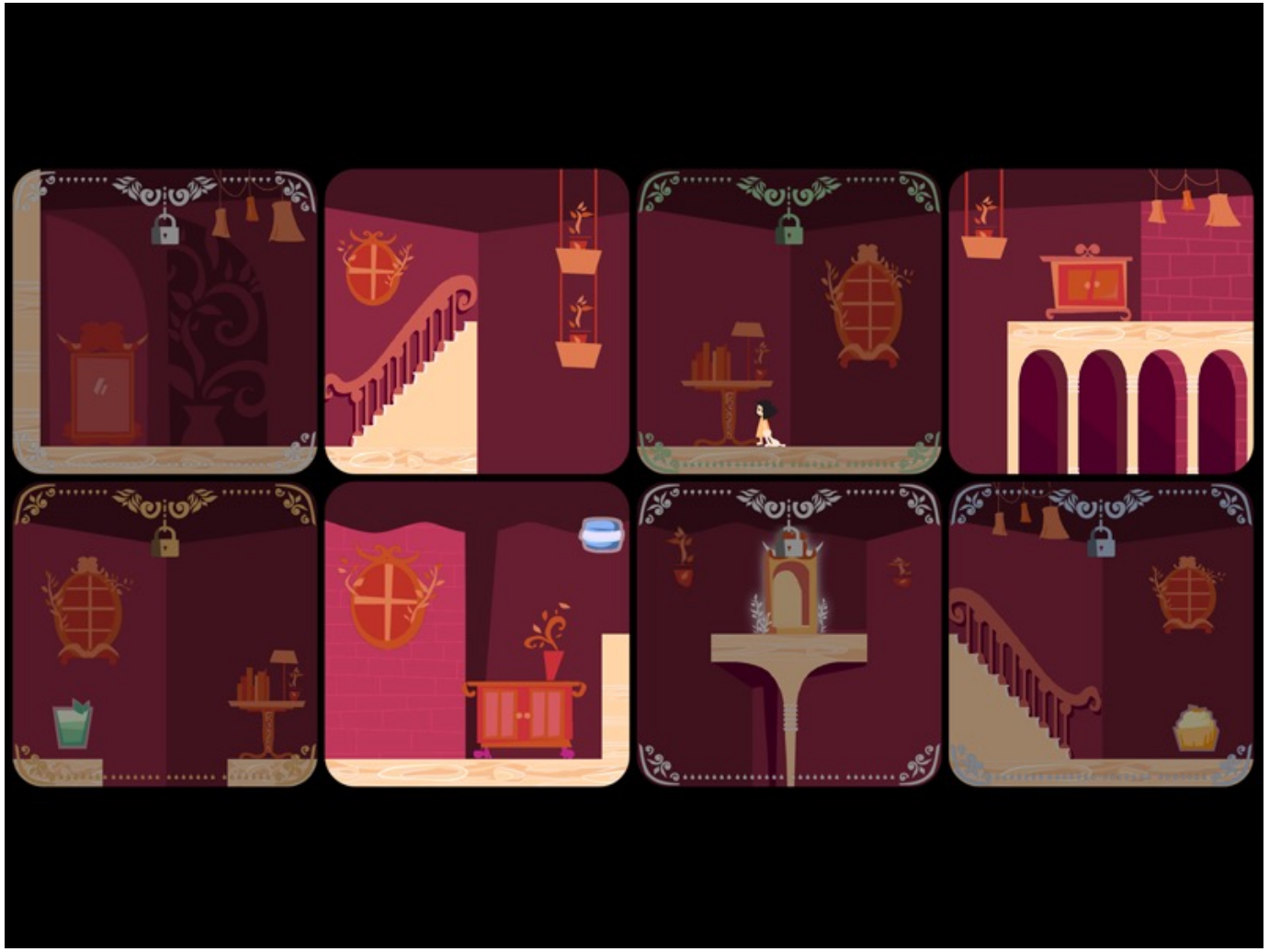
Case Study: *Operation Bitwise*



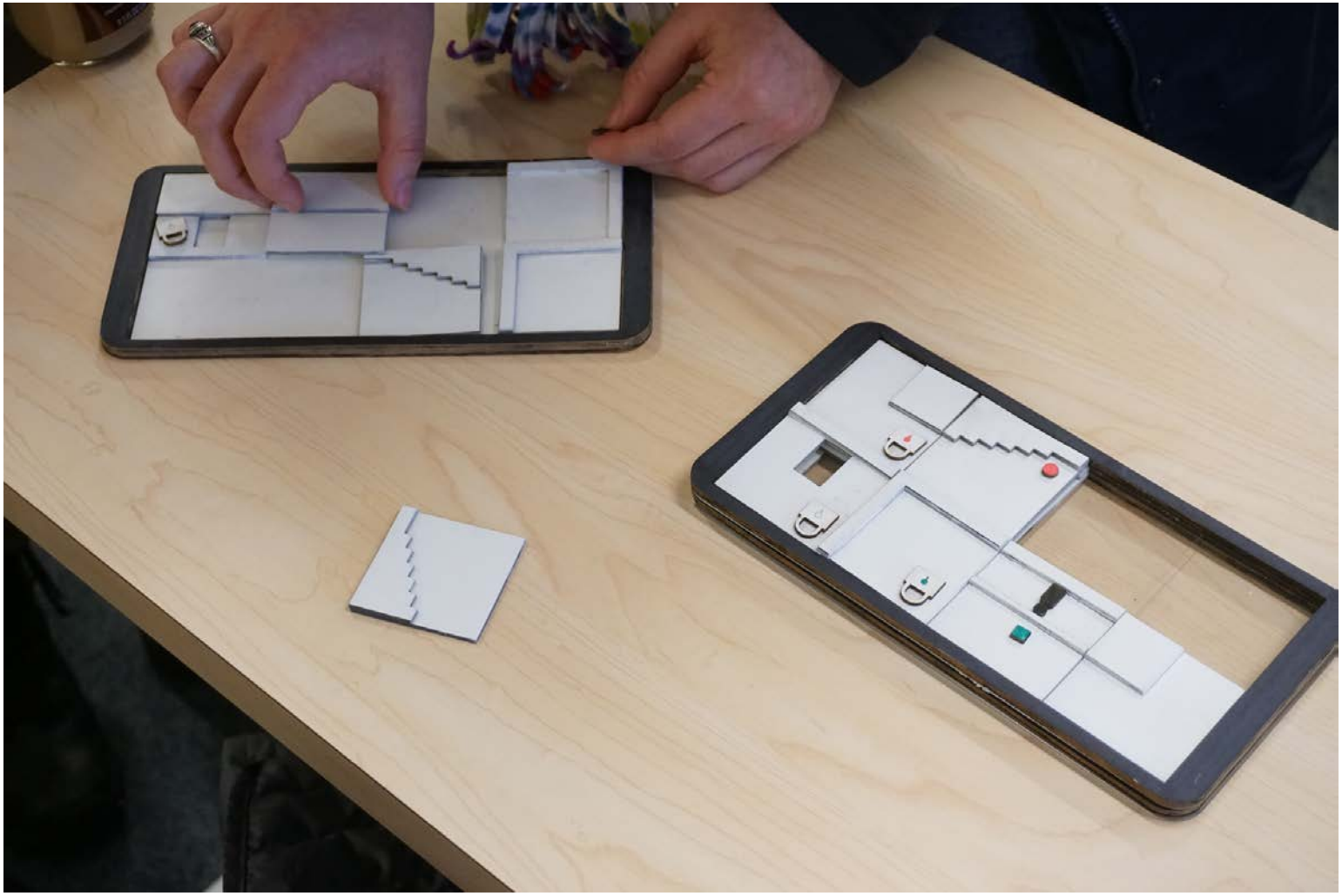
Configurable Protoype from Elements



Case Study: *Magic Moving Mansion*



Configurable Puzzles at Scale

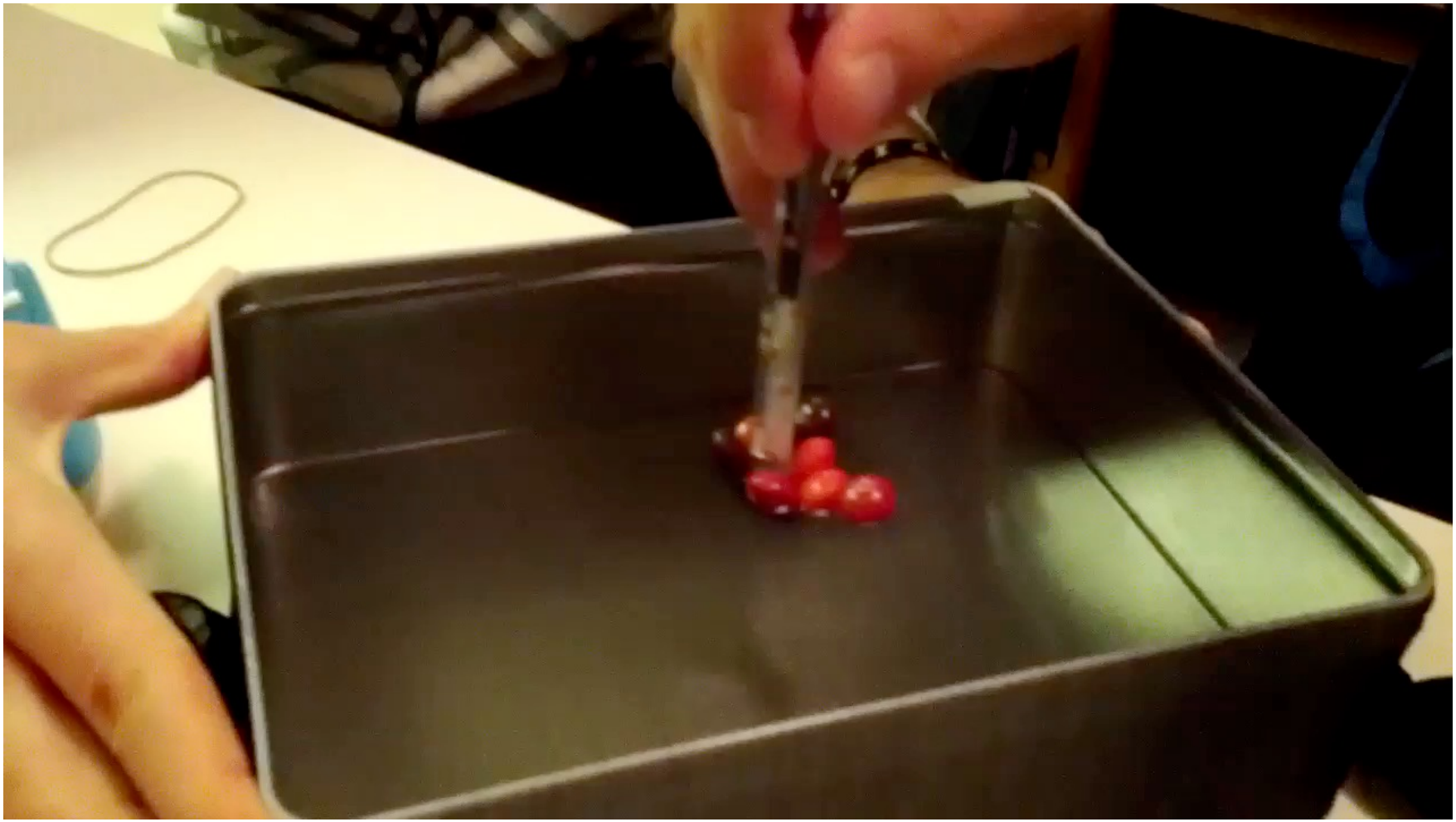


Experiential Prototypes

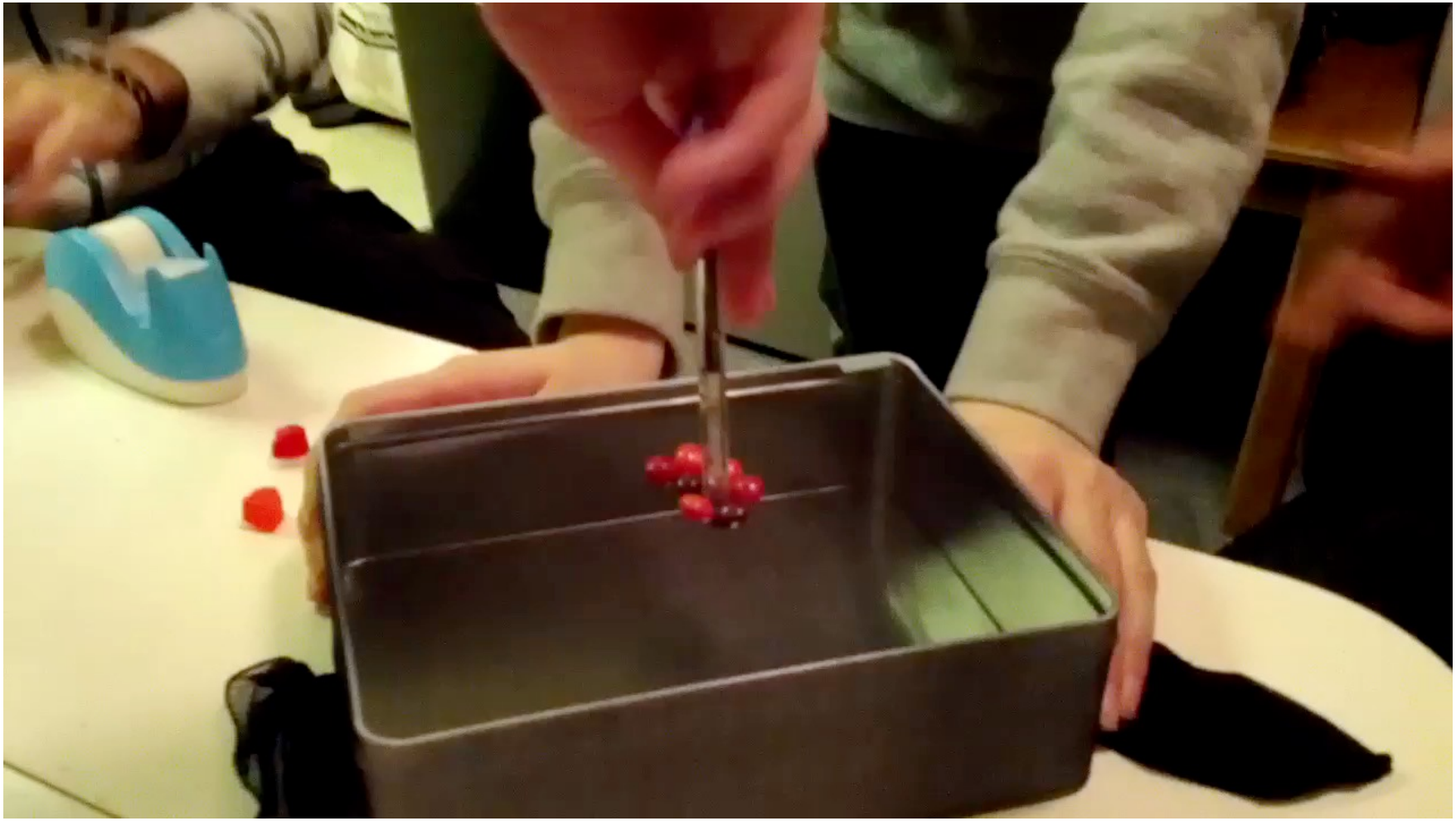
- Some prototypes do not test gameplay
  - They test an experience or feeling
  - You determine if the feeling is enjoyable
  - Then go back and design gameplay for that
- Be very *careful* with this!
  - A very advanced design technique
  - Can easily end up with worthless prototype
  - Have only seen a few successes at this

Case Study: *Gathering Sky*

Feel of Movement Controls



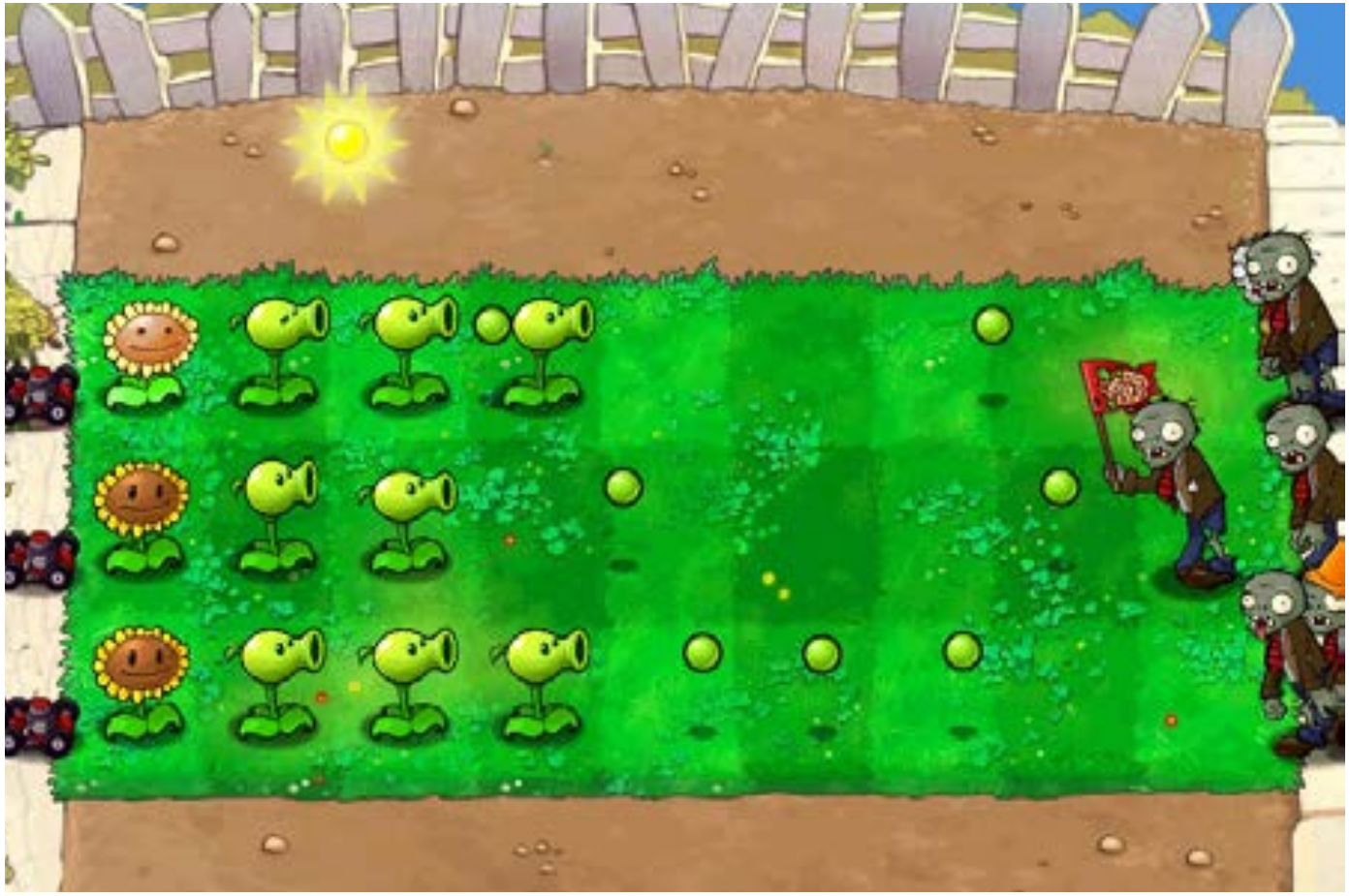
The Experience of Threat



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



Medium

Hard

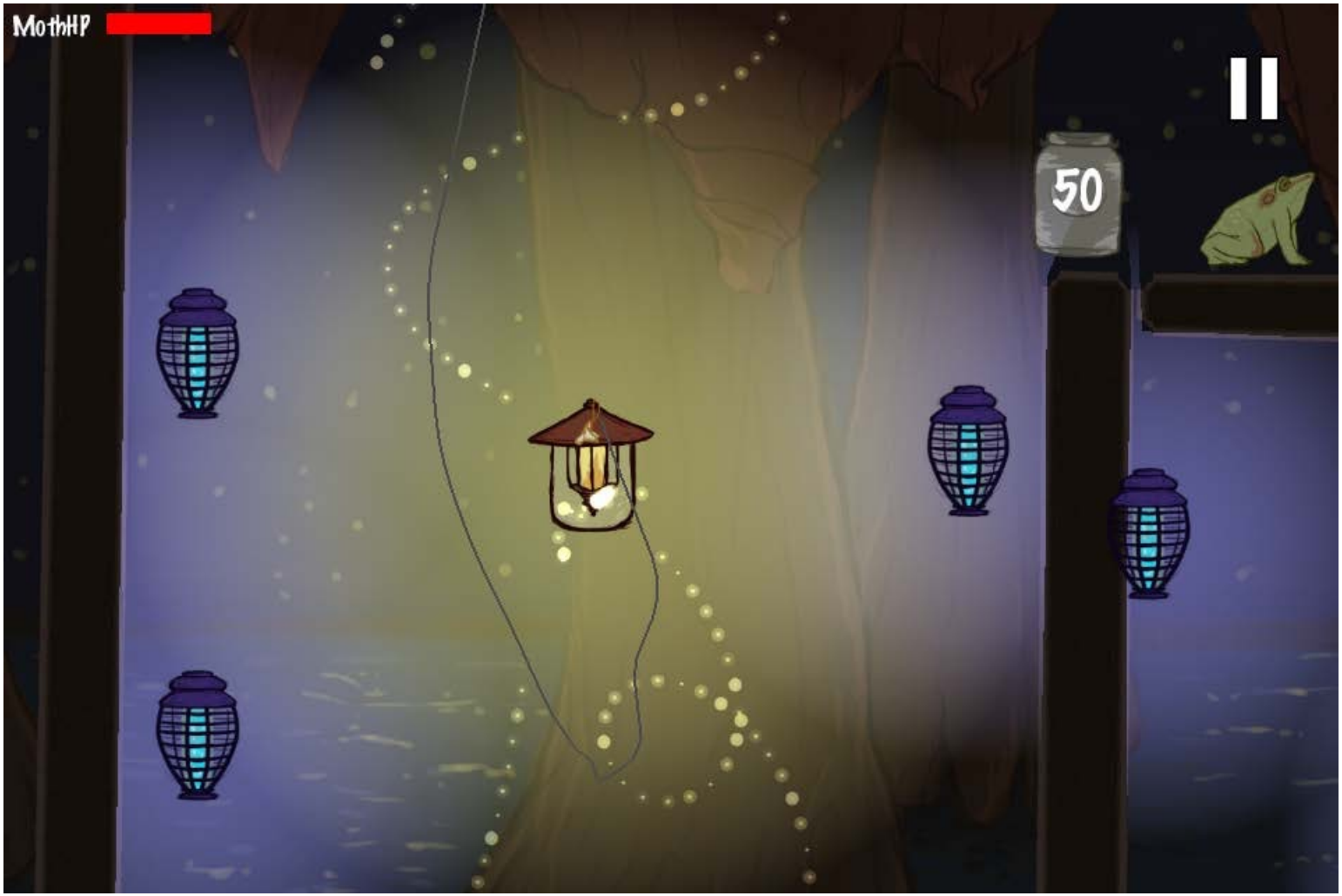
The Difficulty Curve

Easy

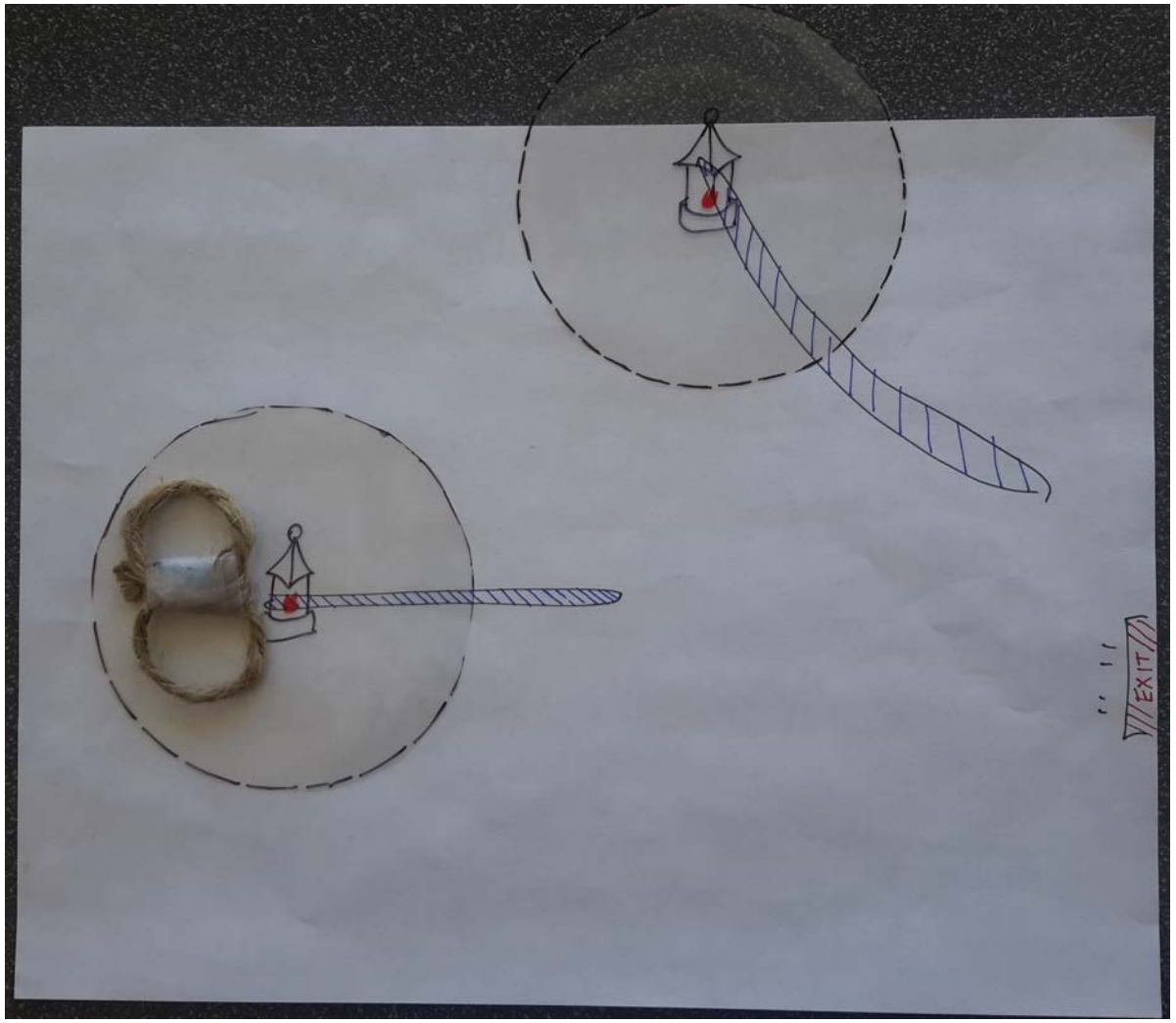
Medium

Hard

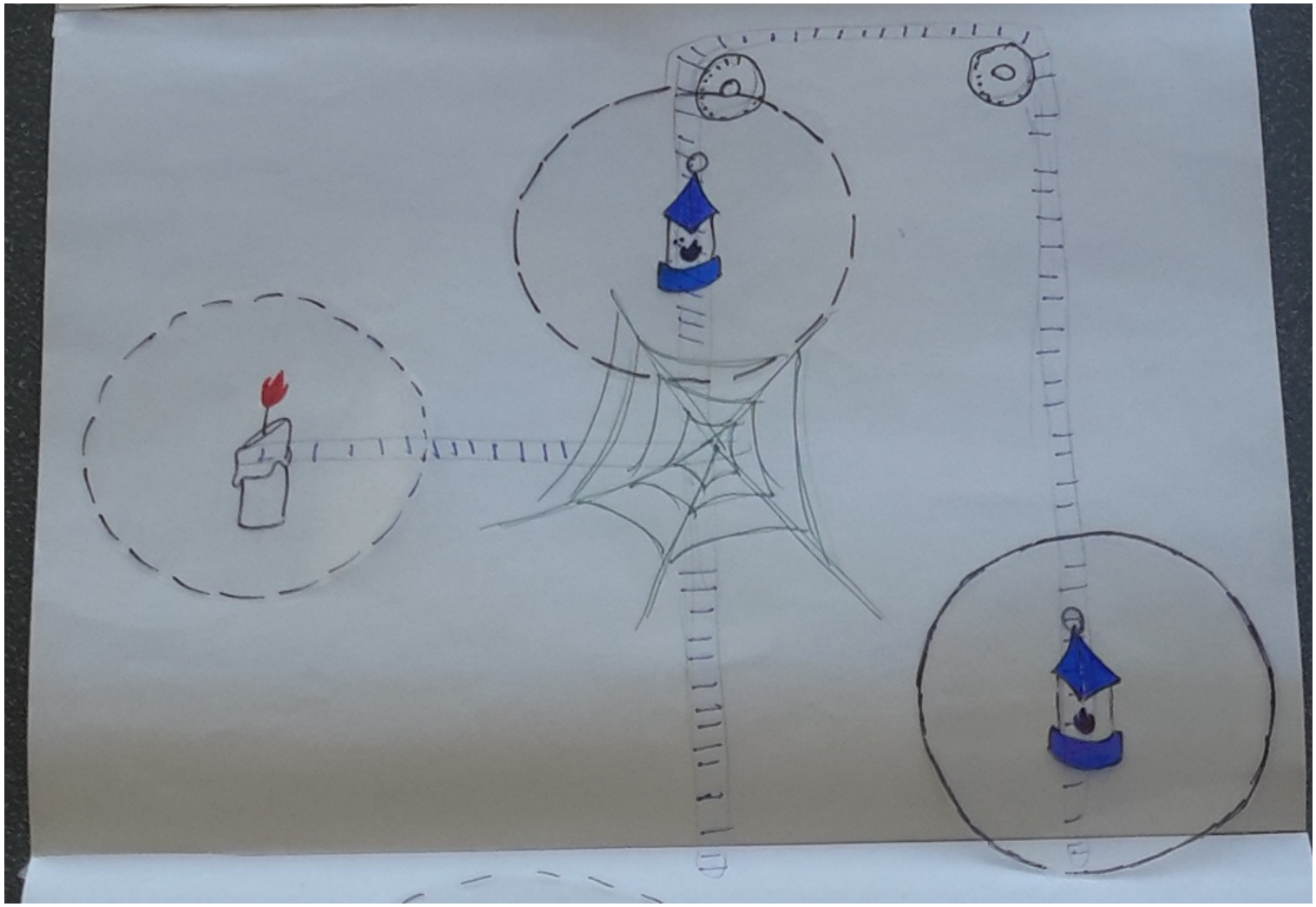
Case Study: *Iridescence*



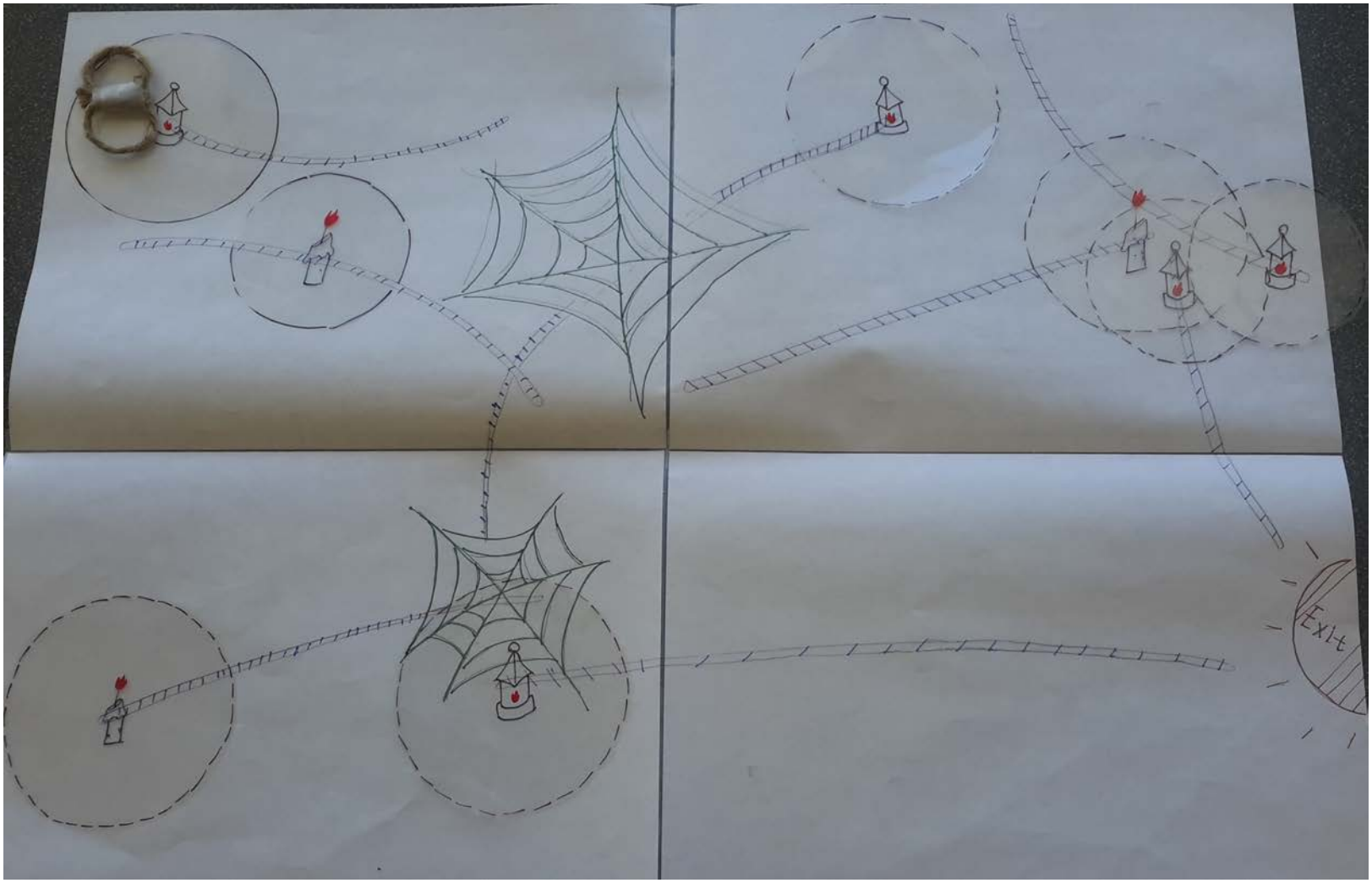
Easy: *Iridescence*



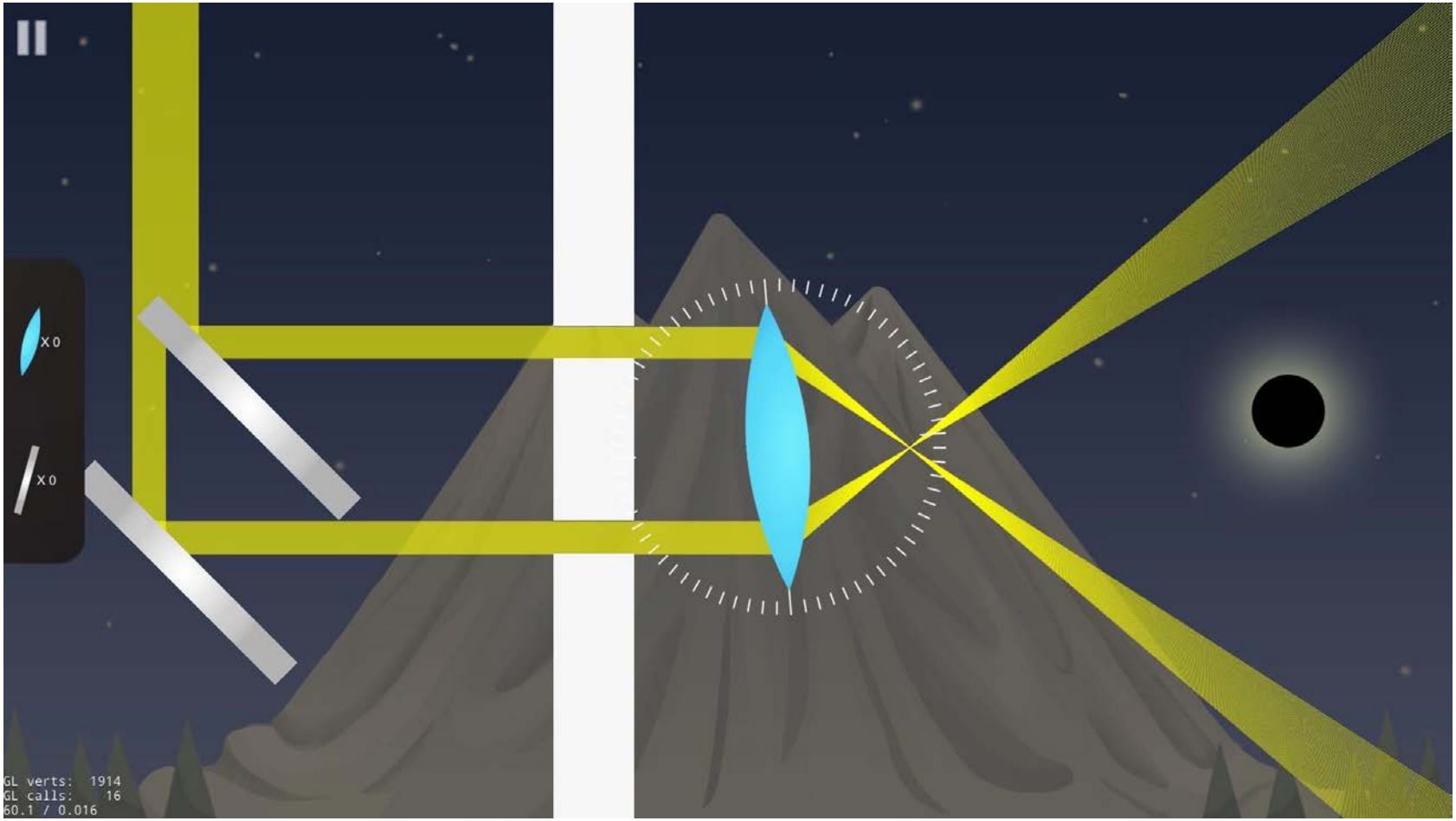
Medium: *Iridescence*



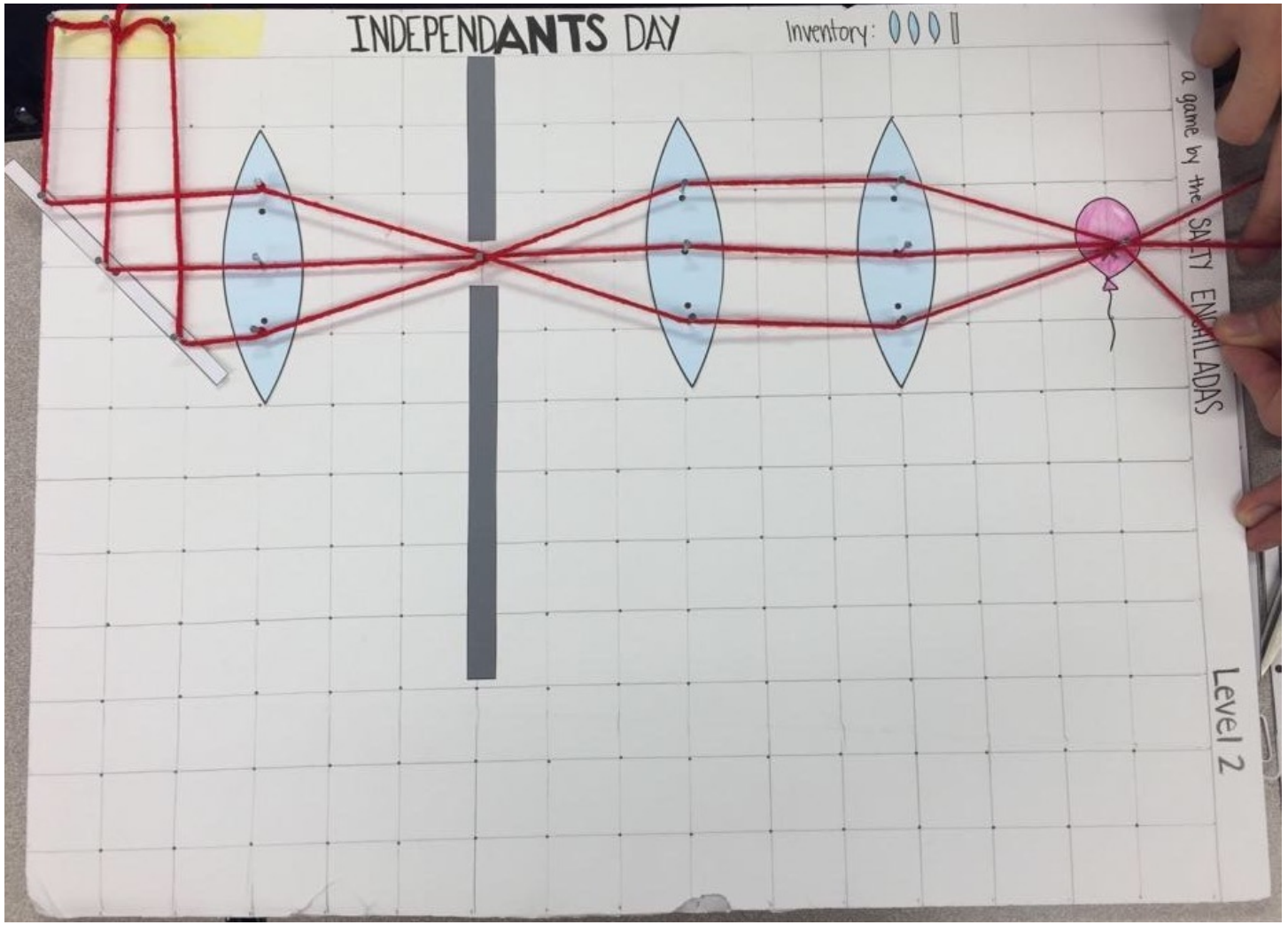
Hard: *Iridescence*



Case Study: *Project Apollo*



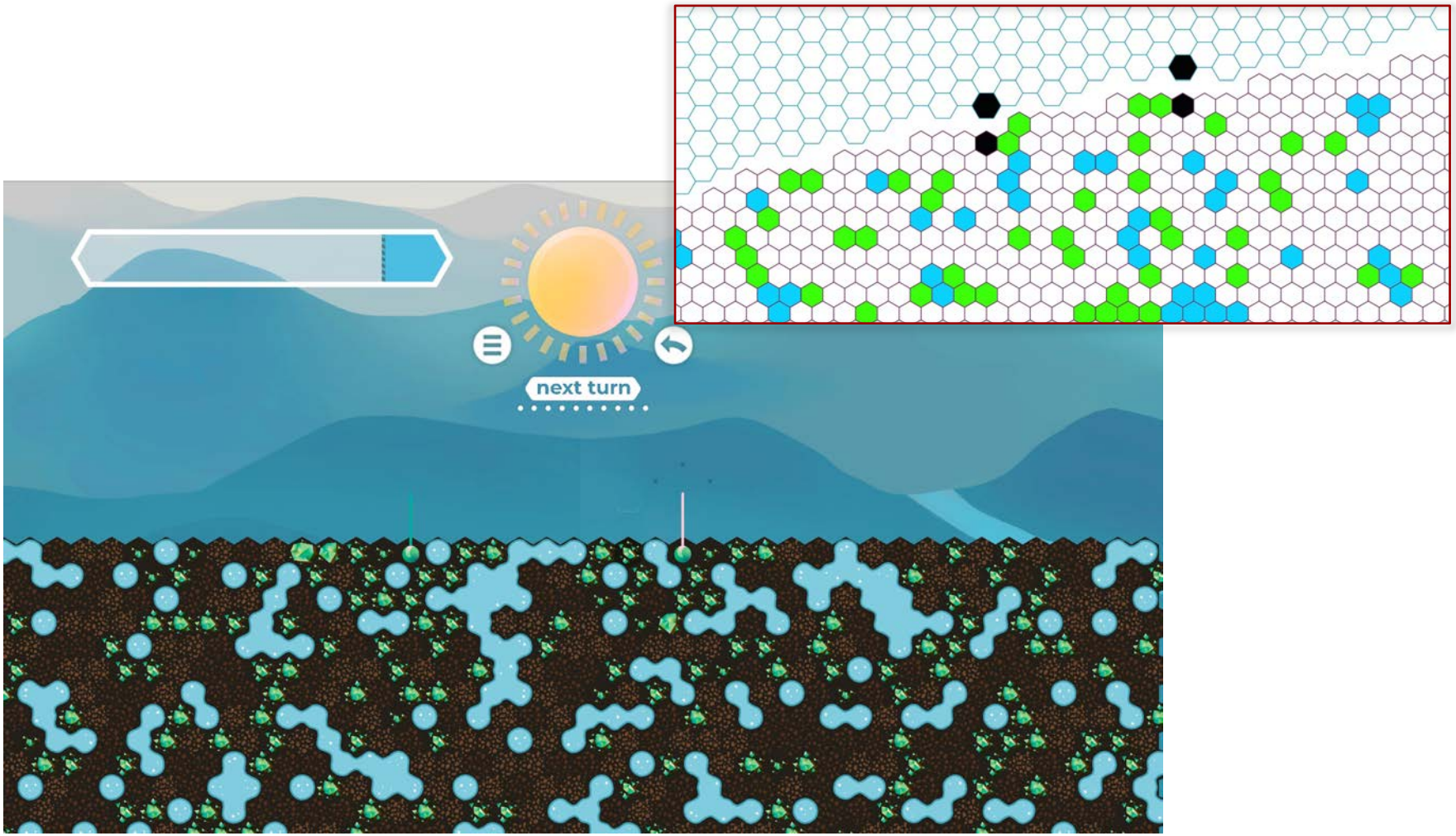
Prototype is a Puzzle Sandbox



Reflecting on What You Have Learned

- Your prototype should teach you *something*
  - About one of the things covered today
  - Even if it is "this design will not work"
- You will be asked about this at **presentation**
  - Must be prepared to answer
  - Write-up as part of submission
- Lesson matters more than **physical artifact**
  - You are not going to sell this prototype

Case Study: Flourish



Case Study: Flourish

Our game seemed unclear at the beginning for some players because [they had to conceptually] balance growth above ground and below ground.

…

In general, we learned about the **specificity we need for different rules that we had thought needed less explanation.**