

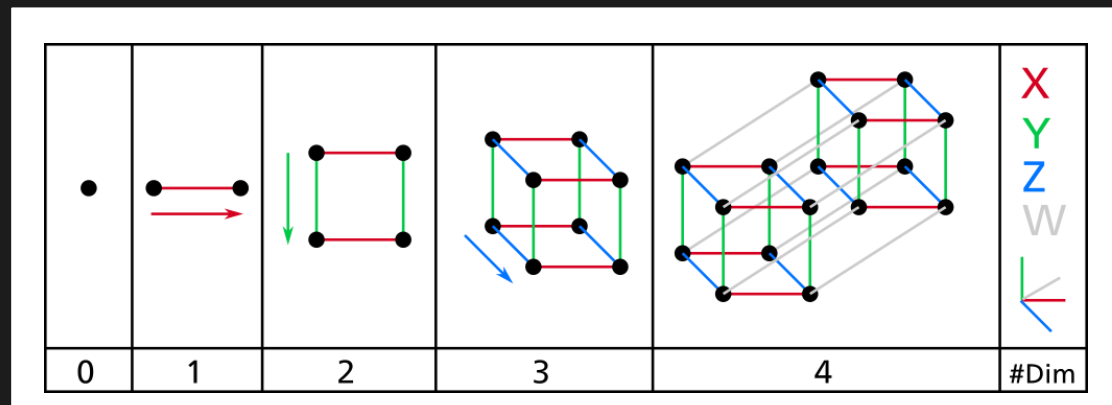
Exploring and Presenting a Game's Consequence-Space.

(How do you find out what is cool about a 4D game and how to you make it so that people understand it)

Miegakure, a 4D game



(x, y, z, w)
Not time!



(Kind of a crazy generalization of “Zelda: A Link To The Past” with more than two worlds and a special way to move between them.)

Miegakure, a 4D game



Might sound complicated but...

Tons of playtesting at PAX and elsewhere and people can play it like any other video game!

Designing Abstractions

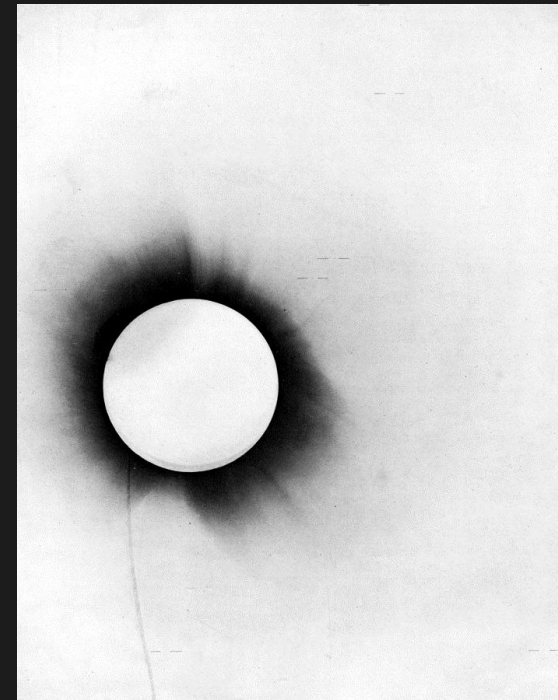
- Choose a level of abstraction for each part of the game.
 - “If” statements, Equations, etc...
- Some abstractions might contain surprising result
 - Encode more than what they were based on
 - A big part of why we do physics

**LIGHTS ALL ASKEW
IN THE HEAVENS**

**Men of Science More or Less
Agog Over Results of Eclipse
Observations.**

EINSTEIN THEORY TRIUMPHS

**Stars Not Where They Seemed
or Were Calculated to be,
but Nobody Need Worry.**



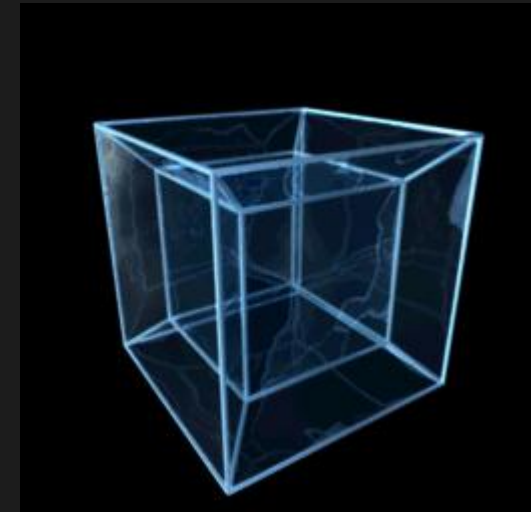
Mechanics Design

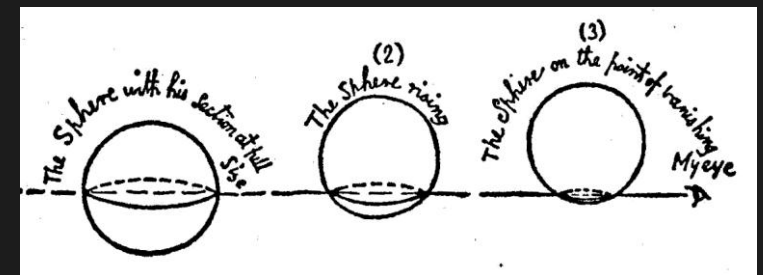
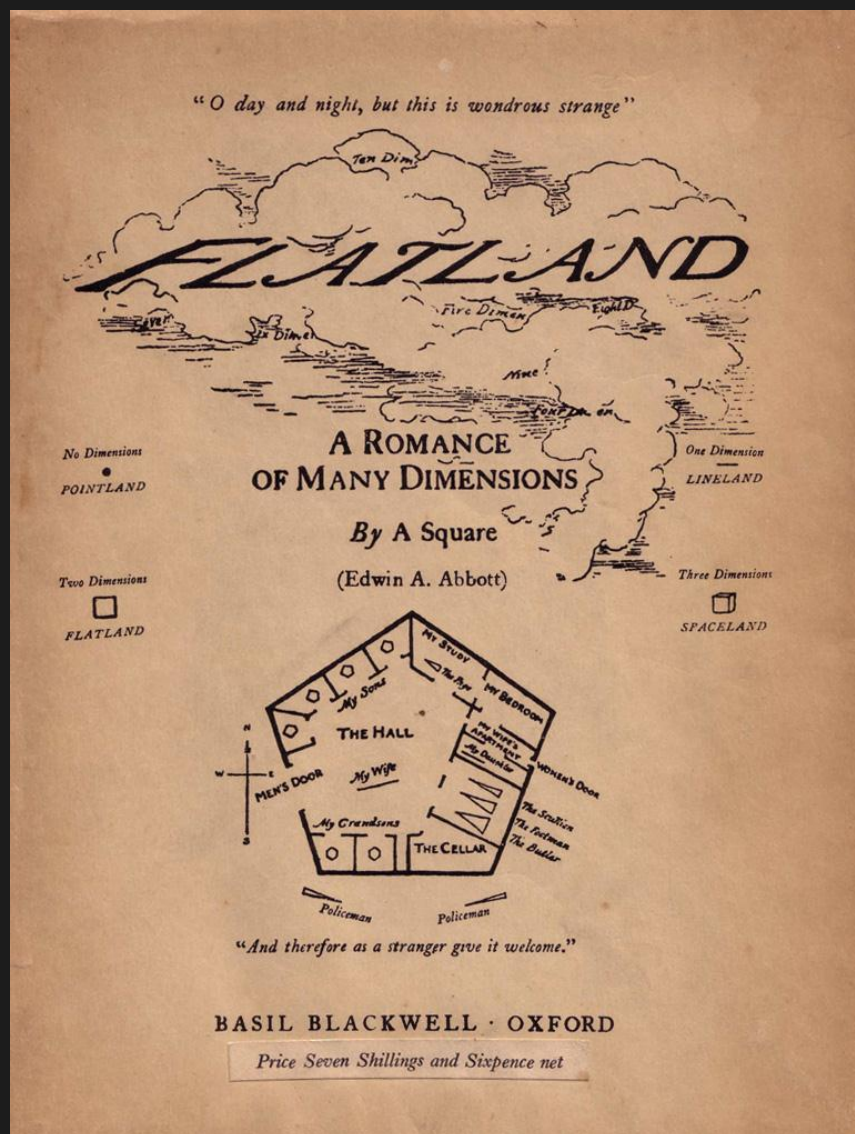
- Select game mechanics so that they create as many interesting consequences/situations as possible, while remaining simple.
- These consequences already exist:
 1. We are just uncovering them,
 2. then presenting them to the player
 - Let players experience them to understand them

1. What are approaches for exploring this space of consequences and finding interesting ones?

(How to find cool consequences of living inside a 4D world?)

1. Explore around a point
2. From other sources
3. Combinatorial Approach
4. Top-Down



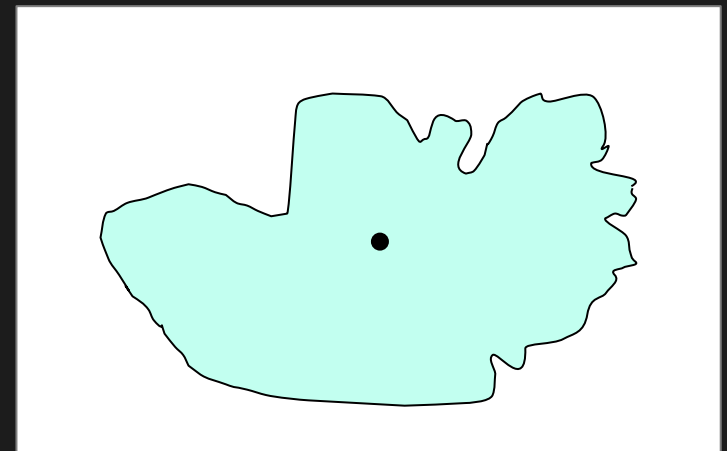


Flatland, E. Abbott, 1884

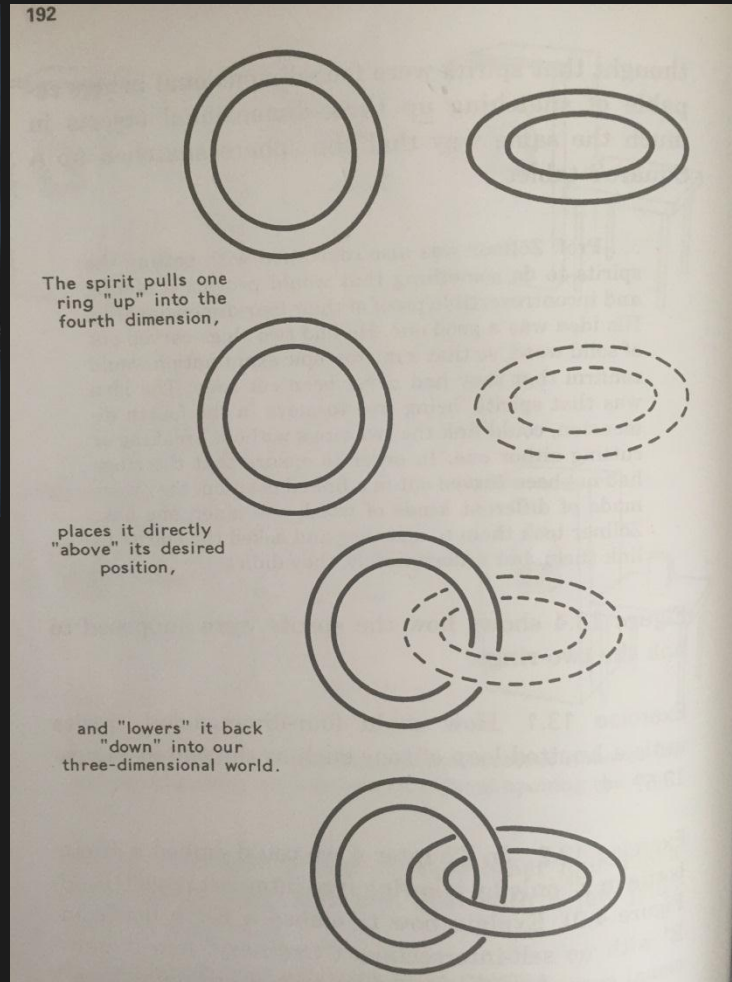
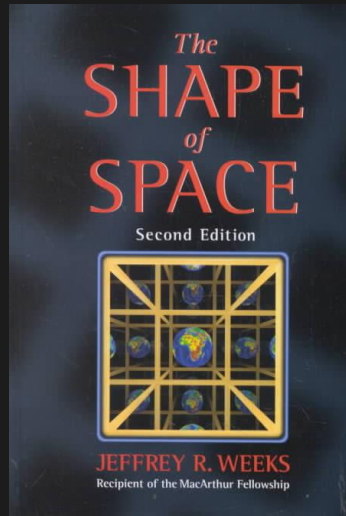


Approach 1: Explore around a point

- While exploring different variations
- While programming the game
- While watching someone else play

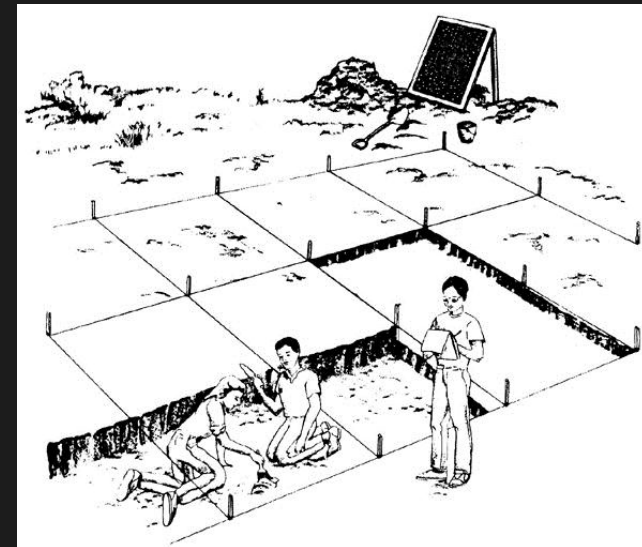


Approach 2: From other sources




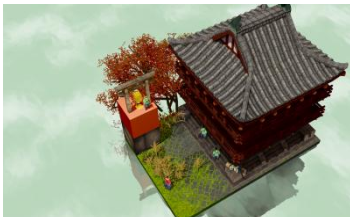

Approach 3: Combinatorial Approach

- Explore the space exhaustively by laying out a grid
 - Looking at pairs of mechanics
 - Looking at all possible shapes/positions of blocks
- It helps to look at each mechanic not simply as an arbitrary gameplay element but as something deeper and more fundamental.



Approach 3: Combinatorial Approach

S^n = sphere of dimension “n”

	S^0 (point)	S^1 (circle)	S^2 (sphere)
S^0 (point)	Many levels...	(2D temple) 	Temple 
S^1 (circle)		Rings 	Chain
S^2 (sphere)			




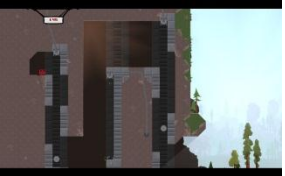
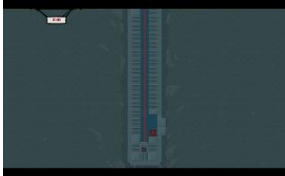







Approach 3: Combinatorial Approach

- Explore variations on different **directions**



Approach 3: Combinatorial Approach

Super Meat Boy

	(by itself)	Saws	Disapearing Block	Projectile Saws	Lasers	Fans
Y (Wall Jump)						
X (Run+ Jump)						

Approach 4: Top-Down

- Previous approaches mentioned were bottom-up
- Have an idea for something that would look cool, but don't know how to turn it into an interesting level
- Hardest, but can be very rewarding



Approach 4: Top-Down

- It helps to try to express the “cool thing” in the system of the game / think of its mathematical representation (just like in the mapping method)
- Try different representations until you connect to something interesting

2. How to present the situations/consequences to the player?

- Lots of work to find interesting situations...
- We don't want players to miss what is interesting about a situation!
 - This is when the game start needing “puzzles”
 - Tried to remove “action game” elements from Miegakure

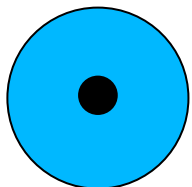


Non-verbally!

No overbearing tutorials, even if it means being a bit lost at first.

Space around the interesting situations

- The solved state is not necessarily the most interesting thing about a situation
 - Player failures give them as much information as successes.

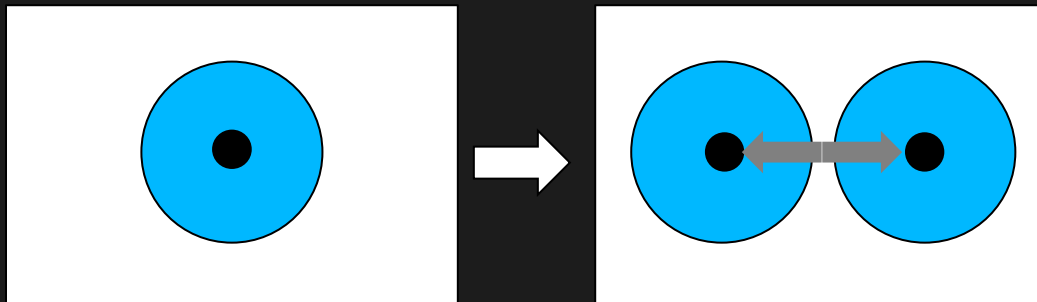


2. How to present the situations to the player?

1. Decompose concepts
2. Sequence concepts
3. Remove arbitraryness
4. Try to prevent brute-forcing
 - Unless it becomes too contrived
5. Build upon concepts
6. Suggest certain aspects

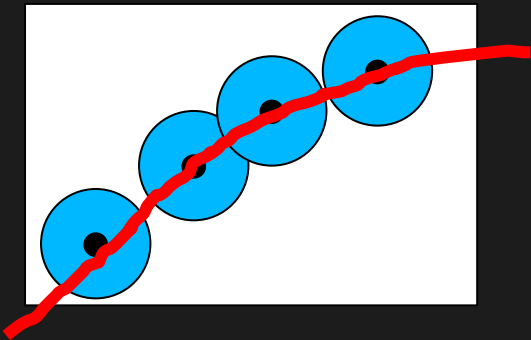
Decompose ideas

- For clarity each level should be about only one consequence only.
- Split a level into two because the players are having trouble absorbing all the information.
- Ex: Miegakure has 3D-only levels to teach concepts like pushing, jumping in isolation.



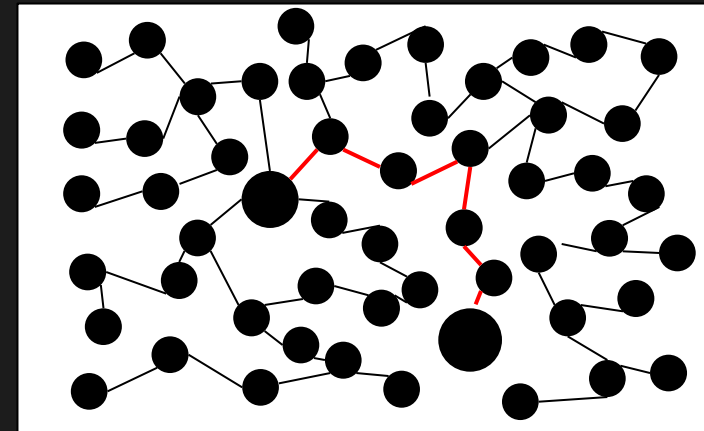
Sequences

- Show relationships between situations
- Teach concepts then use them within more complex situations.
- Make puzzles first, then arrange them by difficulty, then find gaps

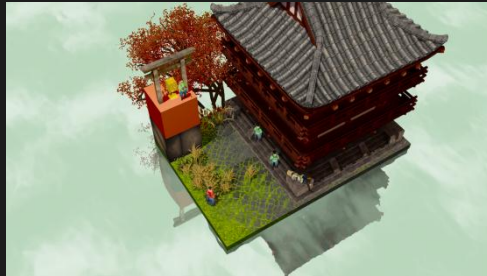


Puzzle Design Method

- Reduce the number of steps needed to complete the level
 - Remove arbitrary steps
 - Once you know what to do it should be simple to execute
- Want a low chance of randomly solving the puzzle
 - Try to increase the number of possible states (lots of ways to get lost)
 - Need to understand the space enough to know the **right** steps



Make Levels Small & Mentally Compressible



Caveat: Simple Levels

- Try to make levels hard to brute-force, but...
- It's ok to let simple levels be easy to brute-force
- If the consequence is simple trying to make the level hard to brute-force will make it feel contrived.



Caveat(2):Build upon simple levels!

- Try to build upon simple levels as stepping stones for more complex ones
- Very important to me! If a game doesn't do this it is wasting its potential.

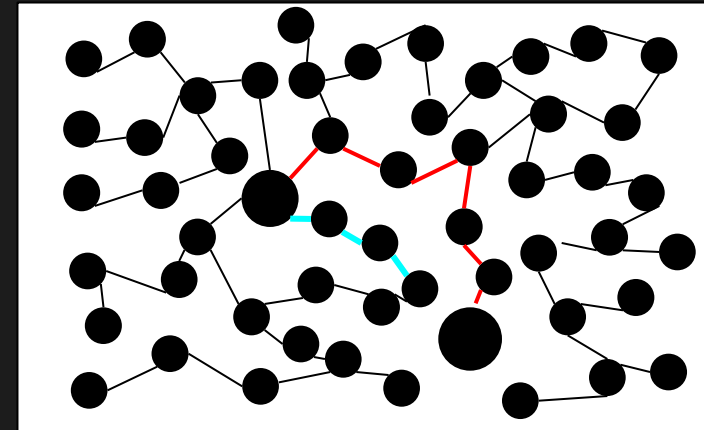
Learning using intuition

- Many players tend to solve problems intuitively unless they are forced not to
 - Trying random or semi-random things (biased on what seems most likely to work)
- Valid way to learn (example: toy ball)
- Simple, brute-forceable puzzles are a good way to let players build up an intuitive model of the system



Starting Momentum

- Initial state of a level always might suggest something to try first
 - Can use that to send players into interesting part of the state space
 - Try to avoid sending players into a state that will be hard or impossible to get out of.



Non-Puzzles

- A lot of the puzzles in Miegakure, even if hard to brute-force are only puzzles because we can't see in 4D.
- The important thing is the underlying system!



miegakure.com

(Will be out when it is done!)

