

Generate Everything

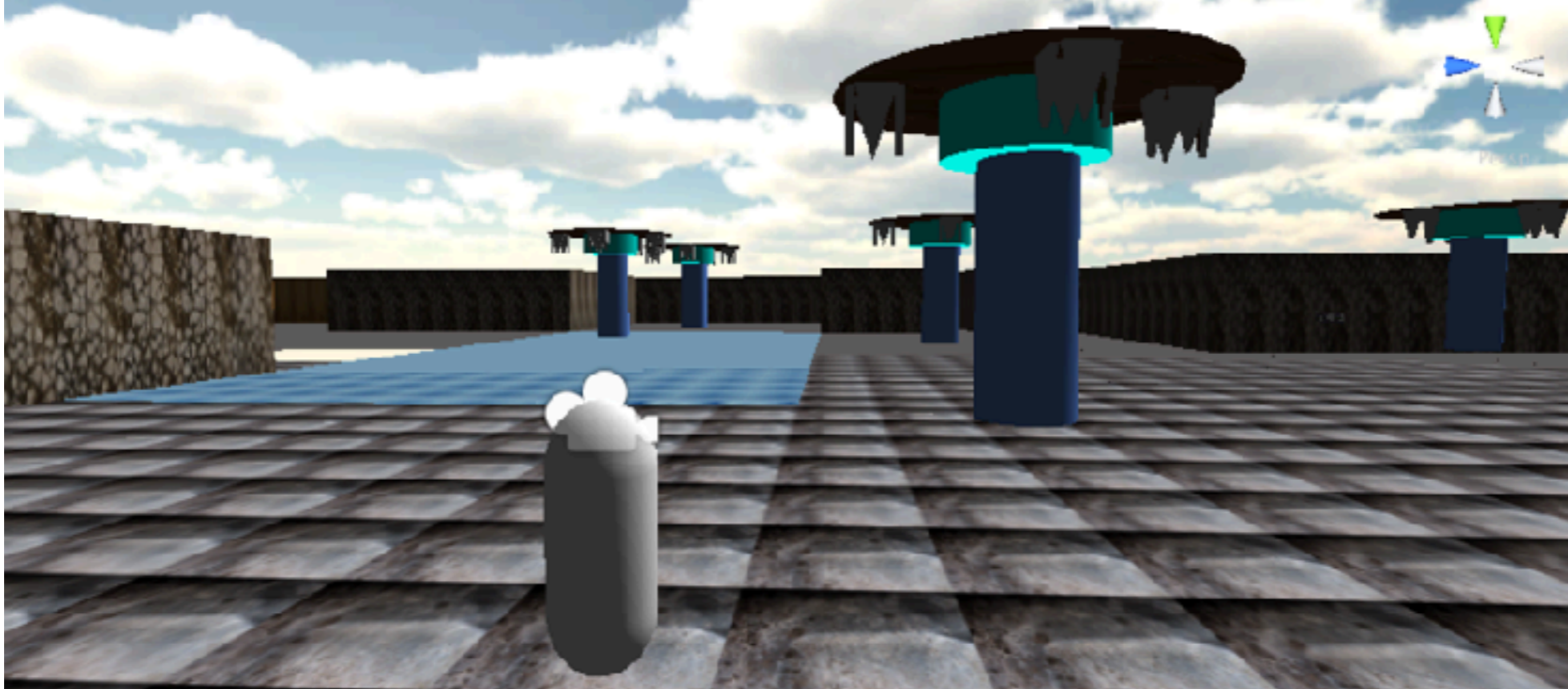
Or 'Scaling Mount Spelunky'

Mike Cook & ANGELINA
Goldsmiths, University of London

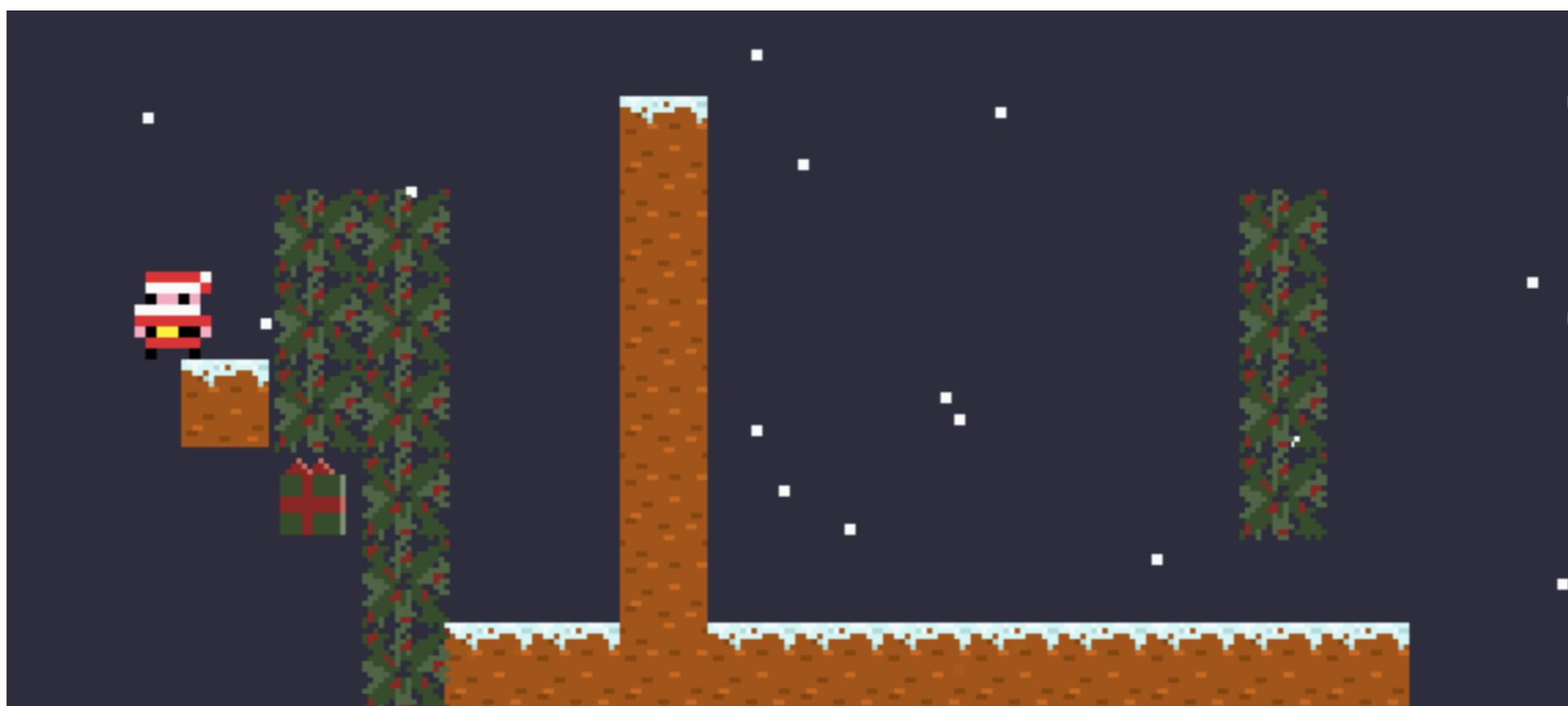
www.gamesbyangelina.org

Aims For This Talk

- Make your games worse



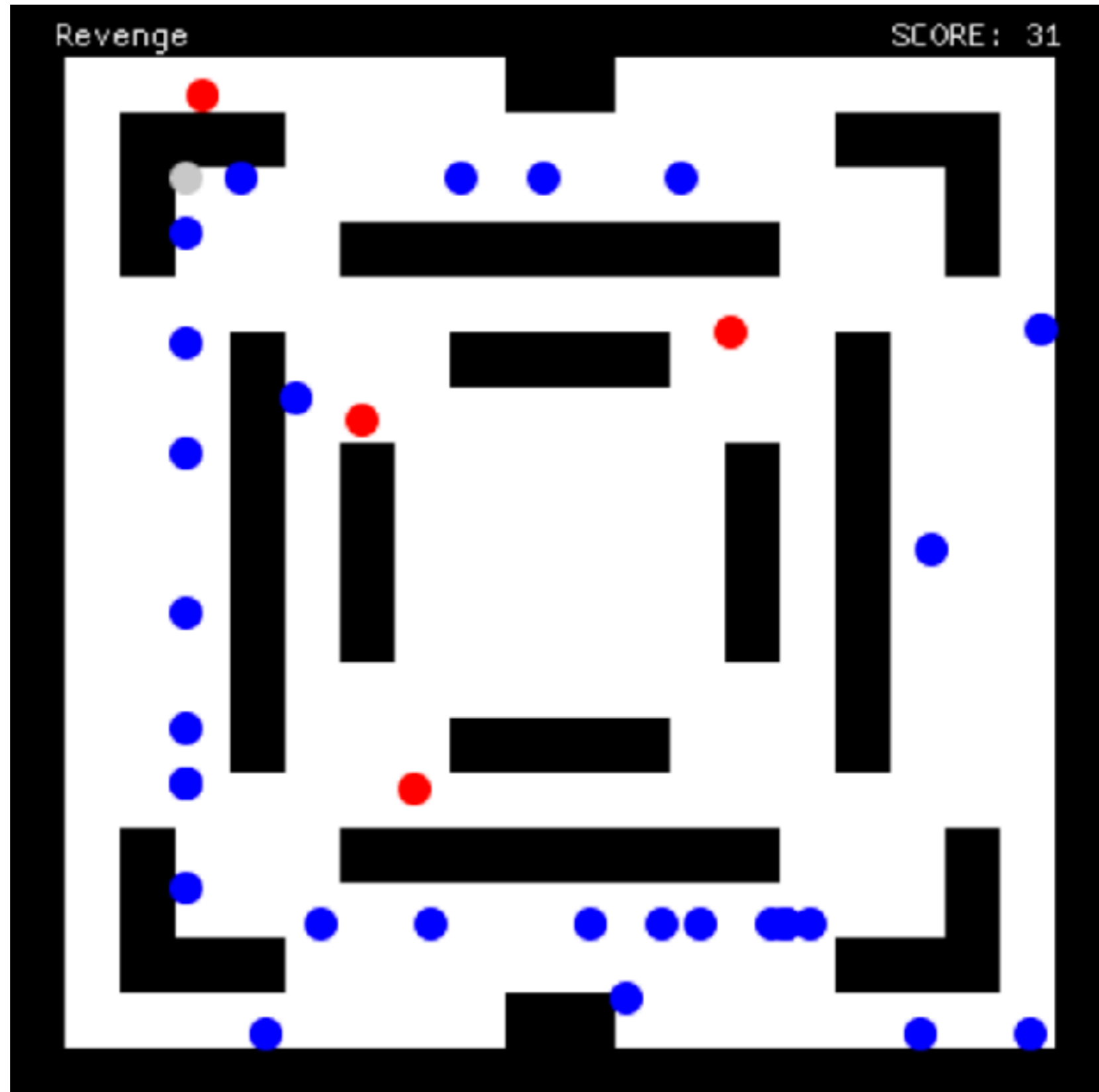
ANGELINA



ANGELINA

Can you generate
games automatically?

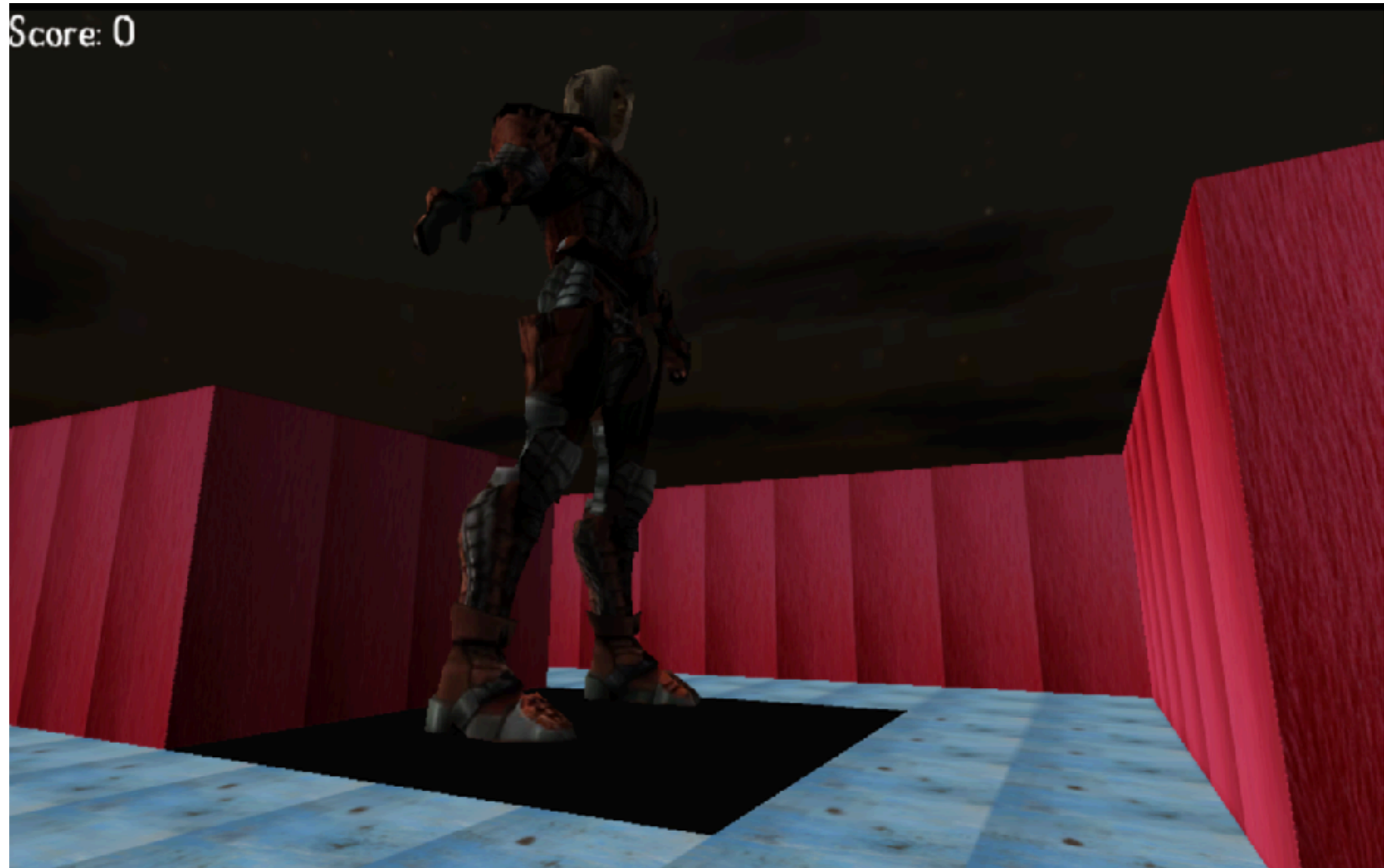
“Probably?”



<http://www.gamesbyangelina.org/games>

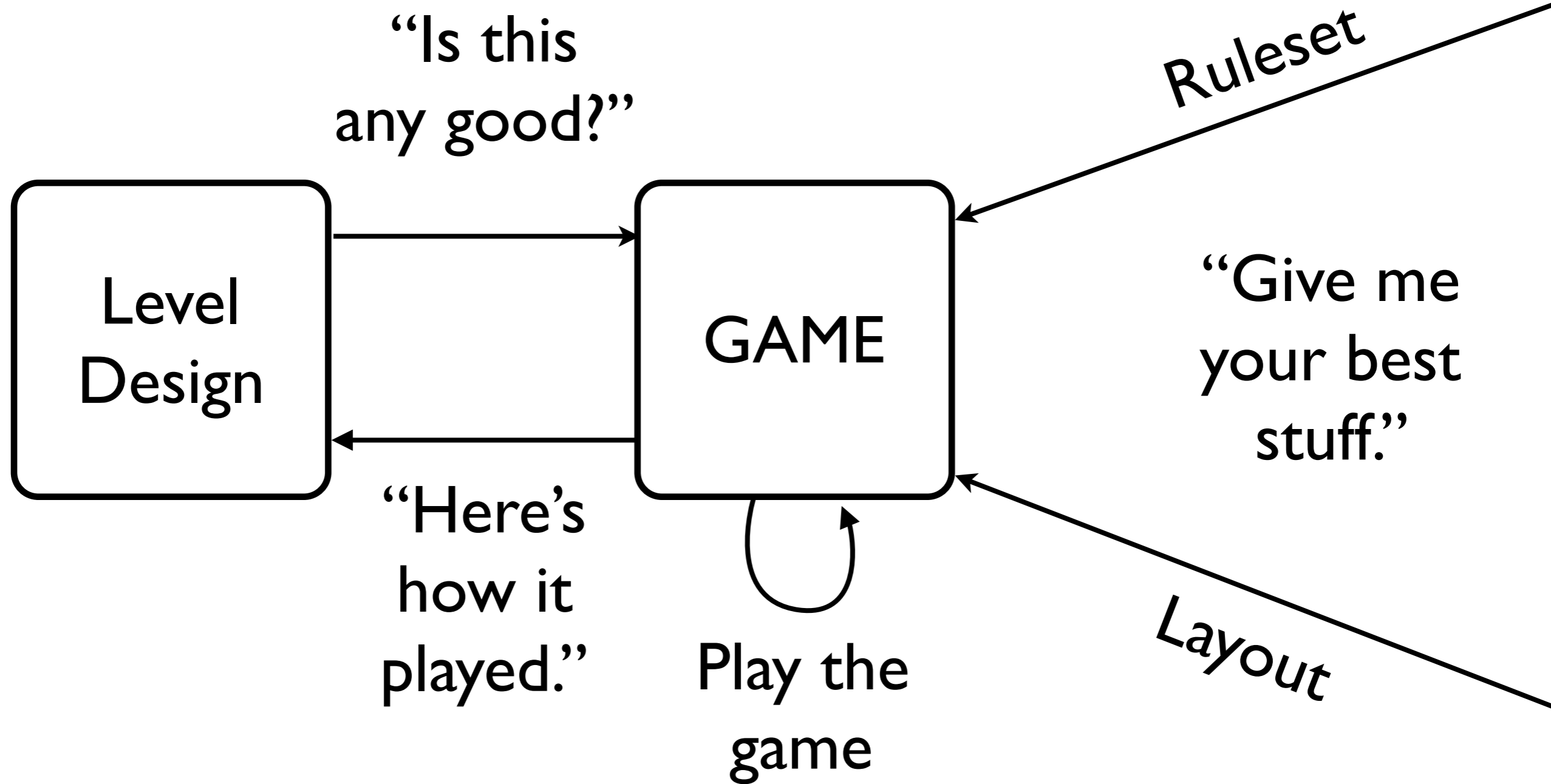


<http://www.gamesbyangelina.org/games>



<http://www.gamesbyangelina.org/games>

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Menu



Designing whole games means unusual generation tasks.

I don't have many answers to most of them, but finding them (and thinking about them) is a lot of fun...

A Rogue Dream

The Cop's Dream - Turn 4

You drift into sleep. [Turn 0]
The dreamlike void pulsates and glows. [Turn 1]

HP - 25



Shoot to kill
Attacks the enemy

A Rogue Dream



why do game developers



A Rogue Dream



why do game developers |



why do game developers **need publishers**

why do game developers **prefer windows**

why do game developers **hate pc**

why do game developers **make cheat codes**

why do game developers **make exclusives**

why do game developers **hate ps3**

A Rogue Dream



why do game developers |

why do game developers **need publishers**

why do game developers **prefer windows**

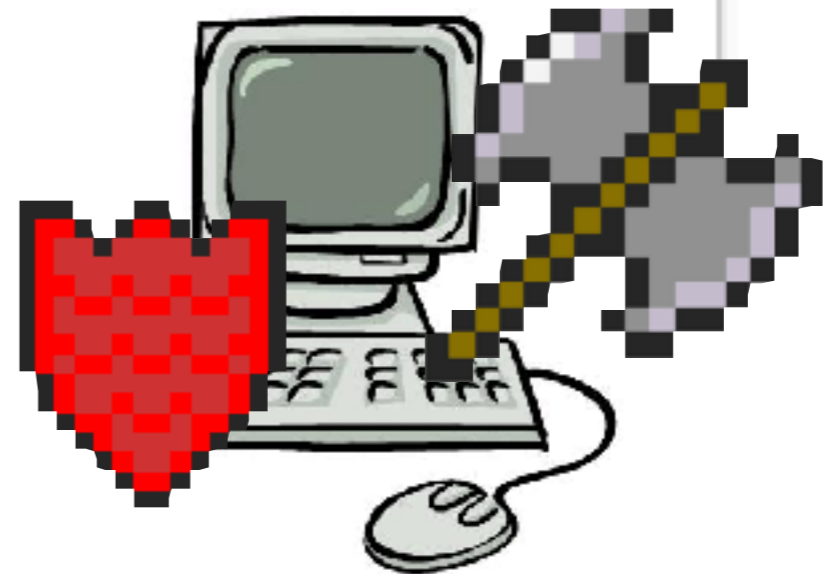
why do game developers **hate pc**

why do game developers **make cheat codes**

why do game developers **make exclusives**

why do game developers **hate ps3**

A terrifying villain...



A Rogue Dream



why do game developers |

why do game developers **need publishers**

why do game developers **prefer windows**

why do game developers **hate ps**

why do game developers **make cheat codes**

why do game developers **make exclusives**

why do game developers **hate ps3**

An awesome power



IDDQD



fixel-gdx v2.55

The Cat's Dream - Turn 3

You drift into sleep. [Turn 0]
The water pulcates and glows. [Turn 1]

HP - 25

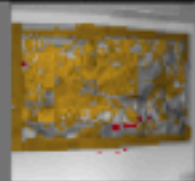


Item: fleas



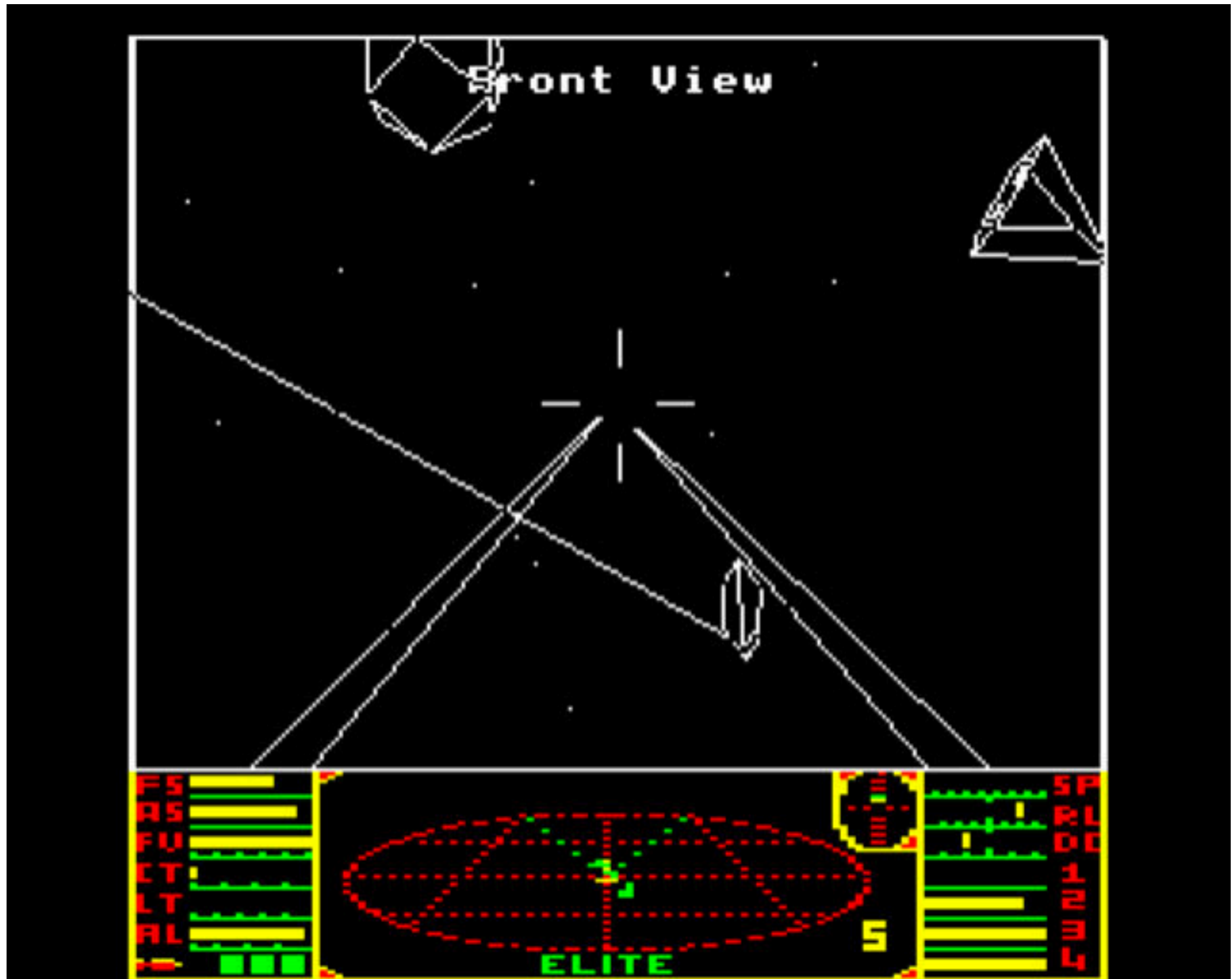
moo
Attacks the enemy

HP - 21



Plagiarize
Attacks the enemy

Procedural Generation



Needs-Driven Procedural Content Generation



Wants-Driven Procedural Content Generation

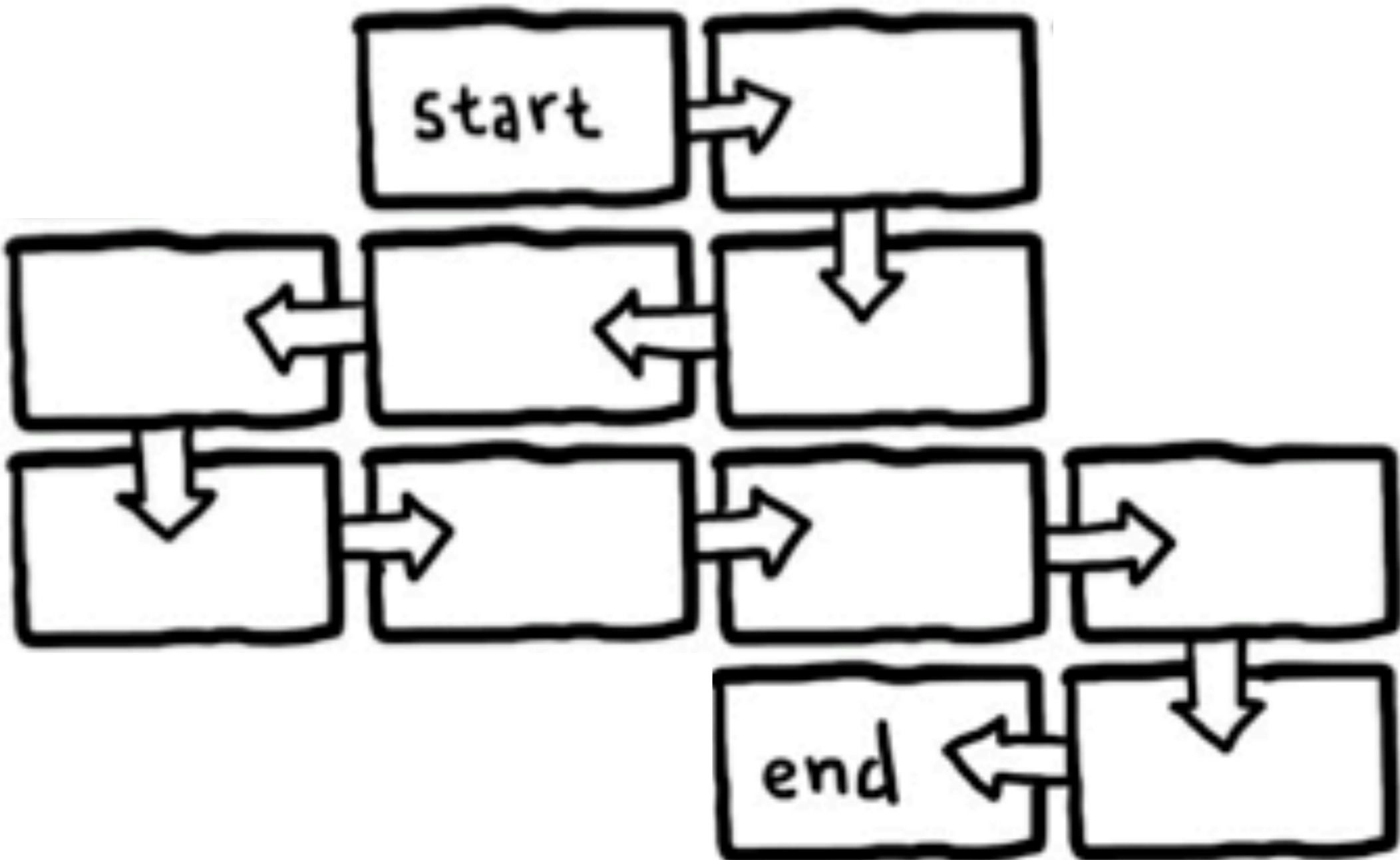


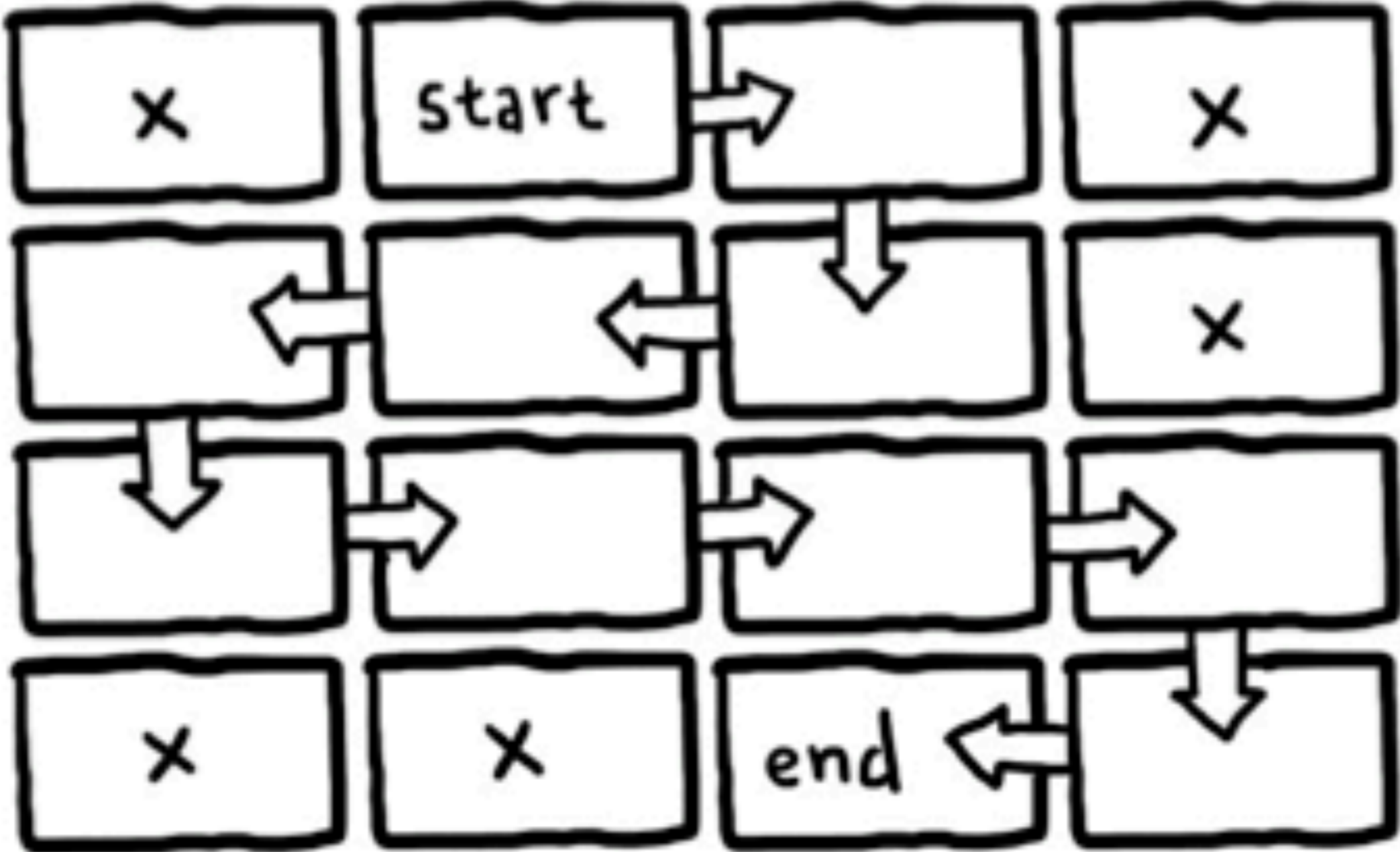


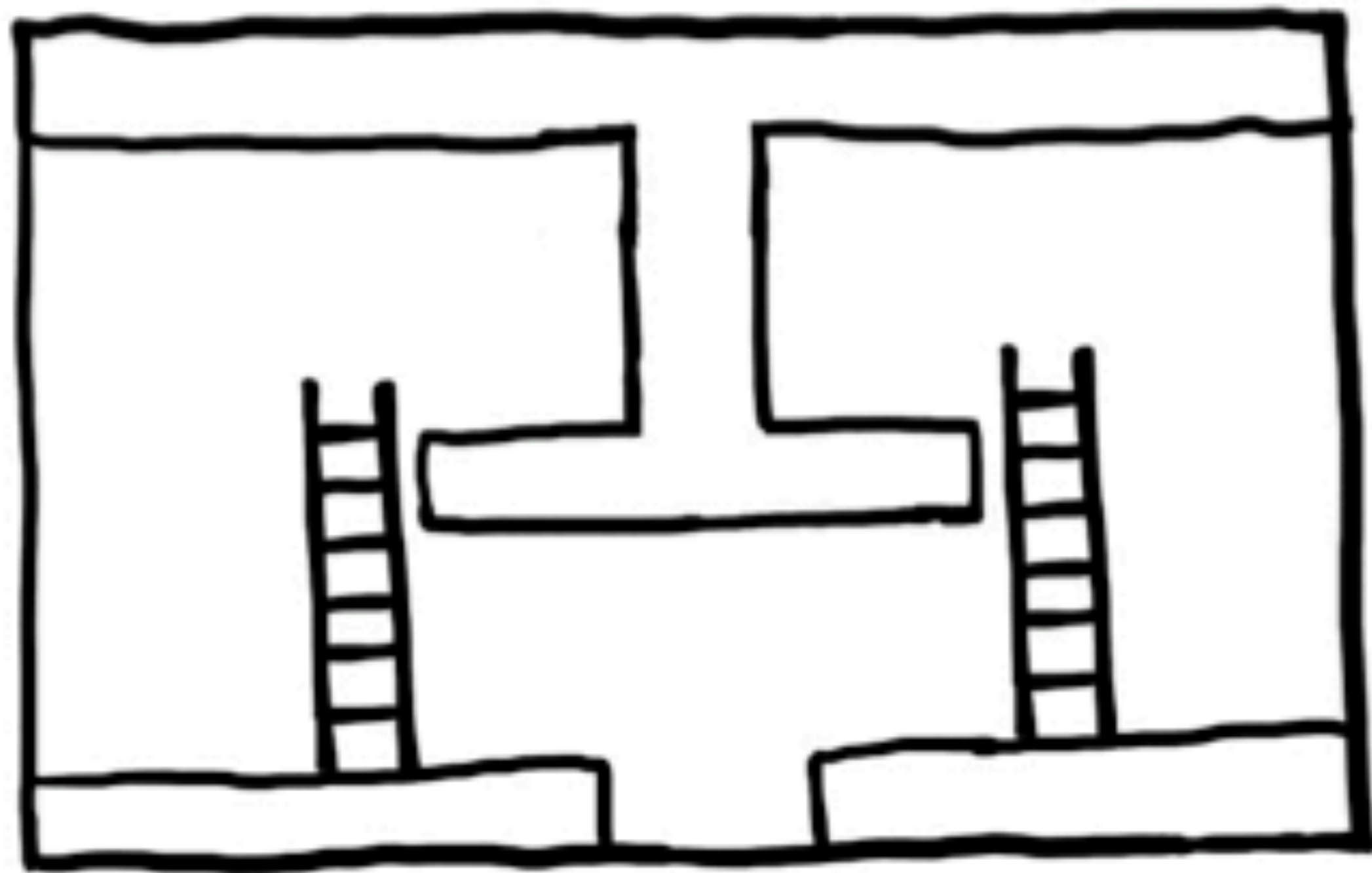
THE DEAD ARE RESTLESS!

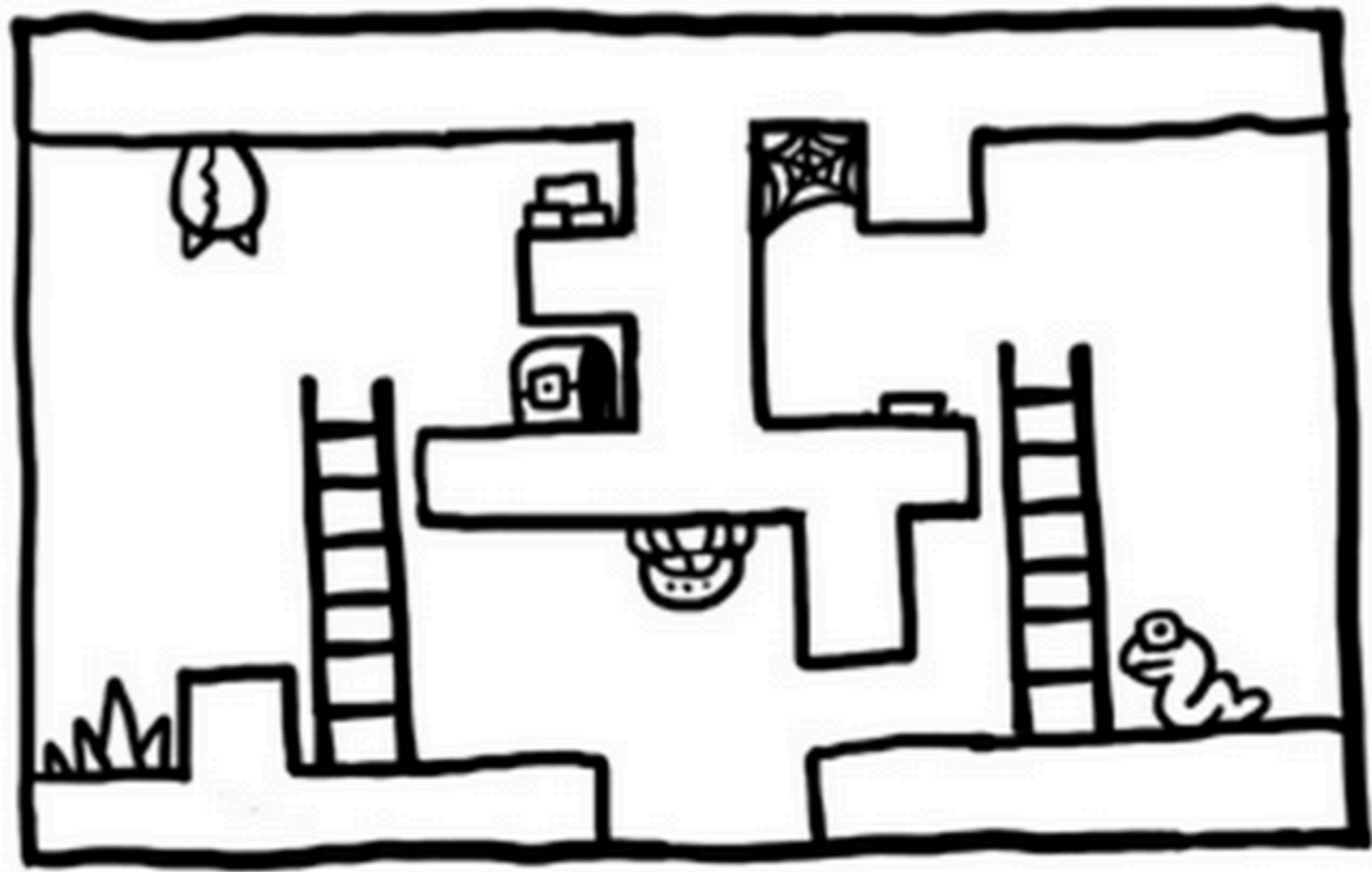
start

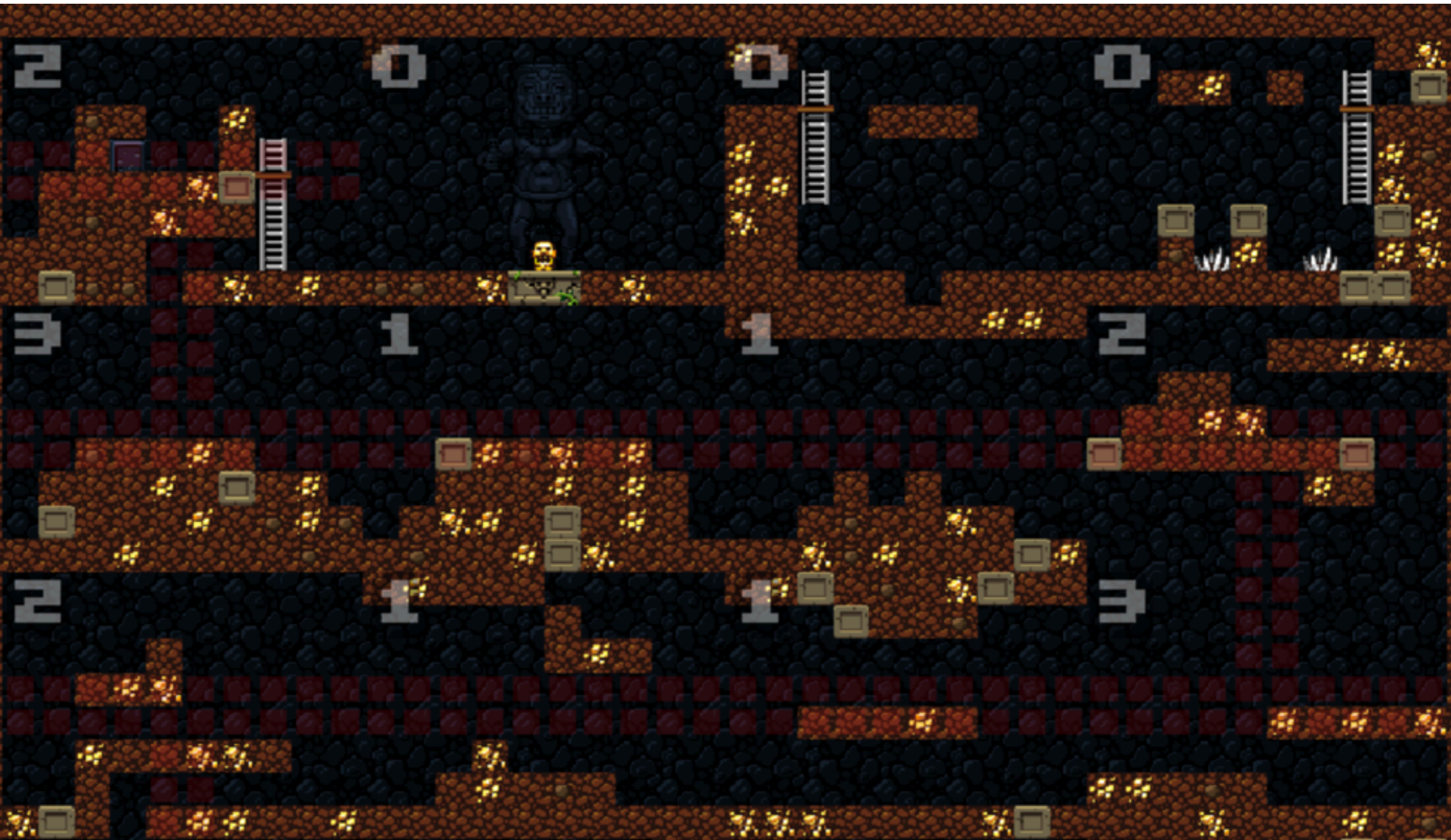
end











tinysubversions.com/spelunkyGen

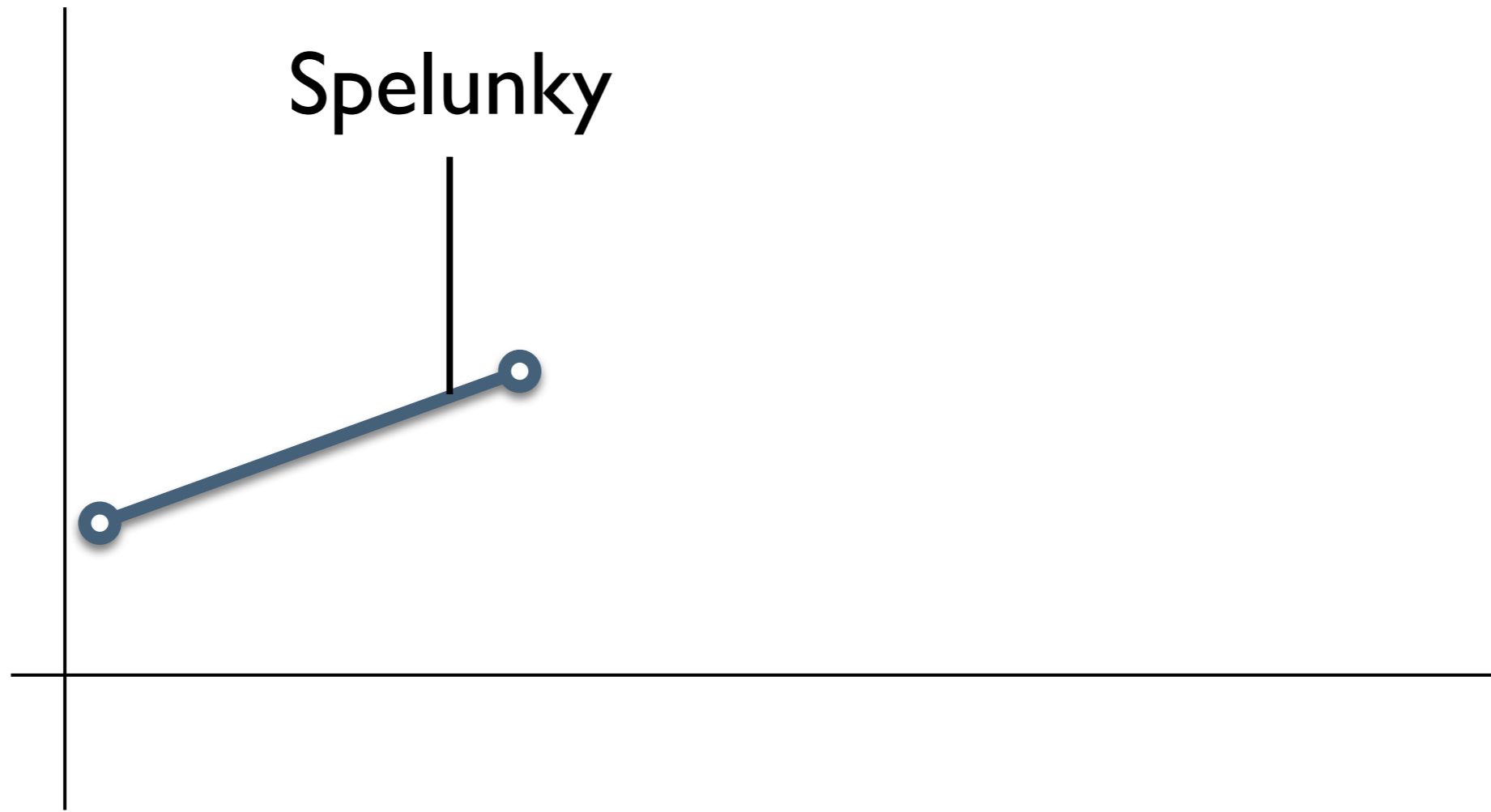
“ “ I wanted the basic interactions in the game to be simple and few, but allow for a lot of improvisation. **And I wanted there to be a lot of chances *to* improvise.**

Google for ‘*The Full Spelunky On Spelunky*’

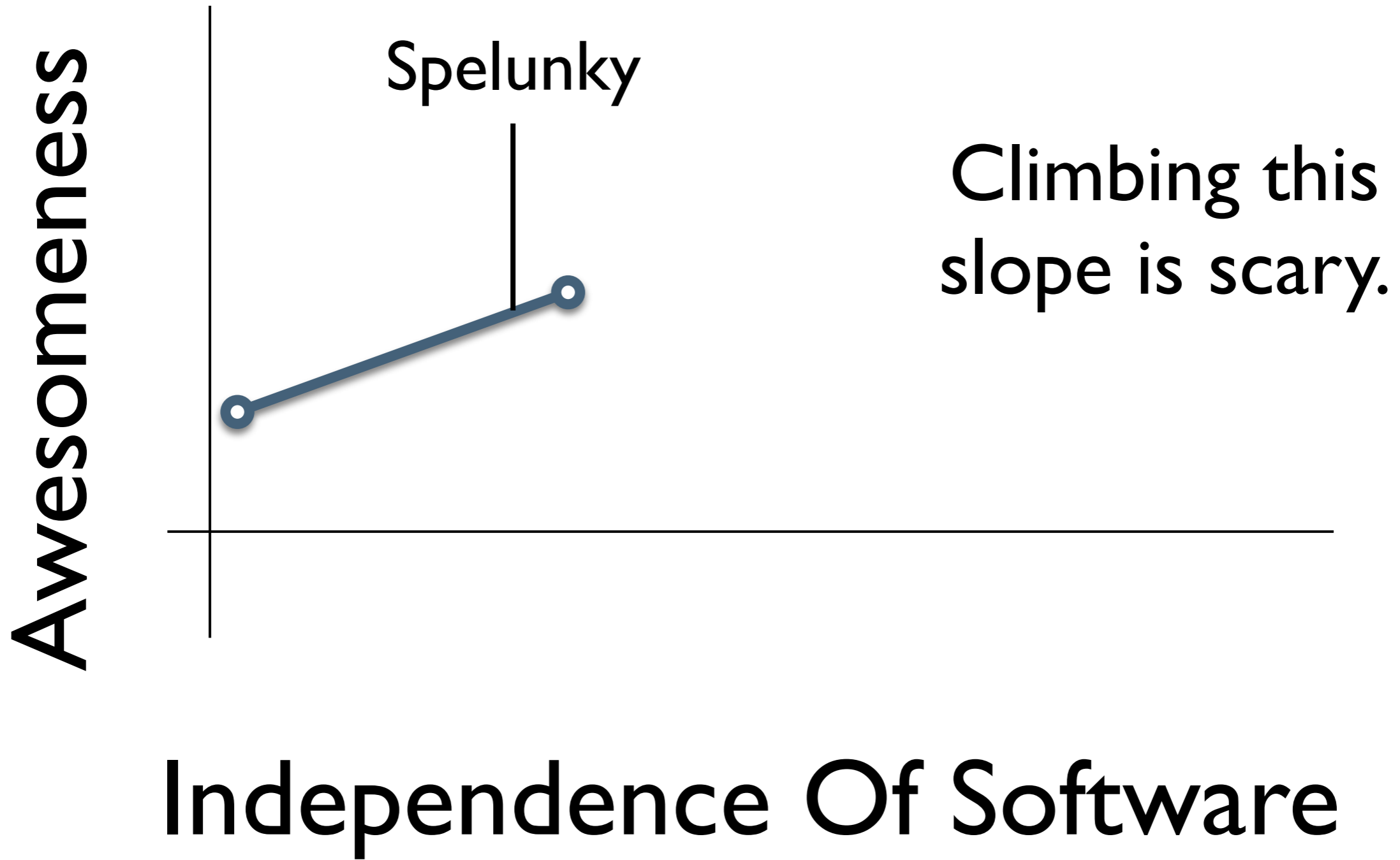
Procedural generation wasn't
just a cool extra for the game.

It made the game's design *possible*.

Awesomeness



Independence Of Software





We respect games that strike a balance between generative power and quality.

But there are things that
Spelunky can't generate, right?



**Minecraft's system has more
freedom in its generation.**

Of course they aren't all
winners...



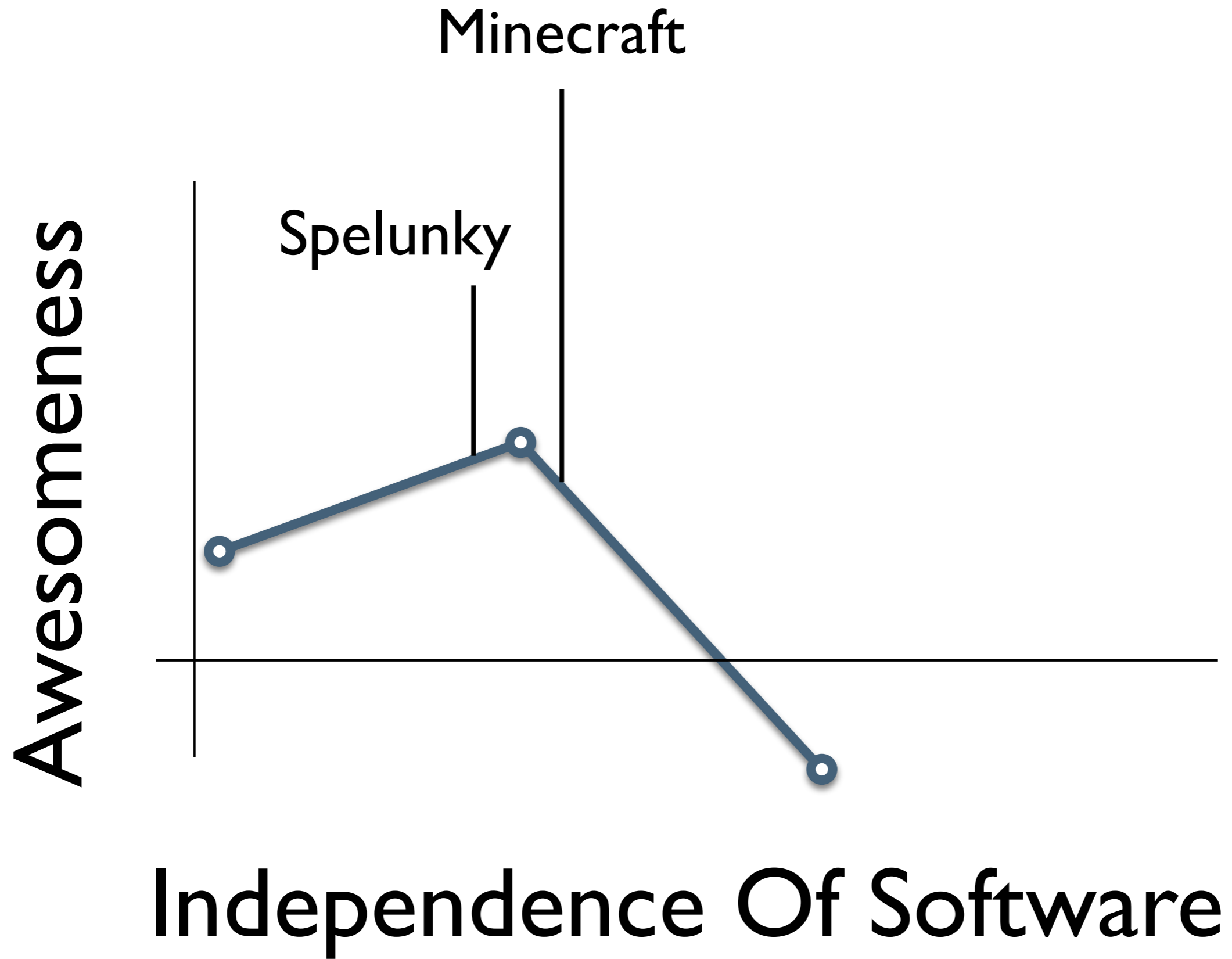
Some are kind of broken



**Minecraft pushes the
independence of its system.**

Sometimes it suffers a bit.

But that's good.





Why is Spelunky (more) restrictive?

Failure can be scary!

**There's no designer around
to clean up and make it OK.**

It's our duty to give the player a
good time... what if it goes
wrong?

Where should game
developers go?

As developers, we have two choices



(Photo by Joanna Breiding!)

We can walk back to
Mount Spelunky.

We know how to make good games,
so let's add that knowledge to our
procedural generators!



Generate a Zeldalike using tiles like Spelunky?

<p>LEVEL REQUIREMENT: 48</p> <p>GGN VOLCANO</p> <p>Damage 439 Accuracy 96.7 Fire Rate 0.8</p> <p>MALIWAN</p> <p>Highly effective vs Flesh Chance to light enemies on fire Pele demands a sacrifice! High Elemental Effect chance</p> <p>\$0165399</p>	<p>LEVEL REQUIREMENT: 48</p> <p>DEF11 TERRIBLE DEFENDER</p> <p>Damage 107x9 Accuracy 51.3 Fire Rate 1.0</p> <p>TEDIORE</p> <p>I can do this all day... +18 Ammo Regeneration +58% Reload Speed -2% Damage</p> <p>\$0145551</p>	<p>LEVEL REQUIREMENT: 48</p> <p>CR380 DESERT RAVEN</p> <p>Damage 183 Accuracy 91.7 Fire Rate 10.0</p> <p>DAH</p> <p>2 more bullets make all the difference +22% Recoil Reduction 1.4x Weapon Zoom</p> <p>\$0186074</p>
<p>LEVEL REQUIREMENT: 48</p> <p>KLR13 PESTILENT DEFILER</p> <p>Damage 541 Accuracy 93.6 Fire Rate 1.0</p> <p>MALIWAN</p> <p>Highly effective vs Armor Chance to Corrode enemies Give Sick High Elemental Effect chance</p> <p>\$0231243</p>	<p>LEVEL REQUIREMENT: 48</p> <p>EQ1 STABILIZED EQUALIZER</p> <p>Damage 383 Accuracy 95.1 Fire Rate 1.6</p> <p>TEDIORE</p> <p>Unending Firepower +41% Reload Speed +18 Ammo Regeneration +50% Recoil Reduction</p> <p>\$0180616</p>	<p>LEVEL REQUIREMENT: 48</p> <p>TD2 DOUBLE BITCH</p> <p>Damage 100x2 Accuracy 90.3 Fire Rate 8.3</p> <p>HYPERION</p> <p>Smack 'em. 3.9x Weapon Zoom +55% Recoil Reduction +42% Accuracy</p> <p>\$0338317</p>
<p>LEVEL REQUIREMENT: 48</p> <p>SG330 BLAST BUTCHER</p> <p>Damage 70x3 Accuracy 58.8 Fire Rate 8.8</p> <p>HYPERION</p> <p>Chance to cause explosions Ahhh... Fresh meat! +500% Burst Fire Count +41% Recoil Reduction</p>	<p>LEVEL REQUIREMENT: 48</p> <p>SV440 MALEVOLENT SAVIOR</p> <p>Damage 134 Accuracy 85.0 Fire Rate 14.6</p> <p>TEDIORE</p> <p>Hallelujah +18 Ammo Regeneration +19% Reload Speed +23% Damage</p>	<p>LEVEL REQUIREMENT: 48</p> <p>MAL31 PESTILENT DEFILER</p> <p>Damage 371 Accuracy 96.4 Fire Rate 1.6</p> <p>MALIWAN</p> <p>Highly effective vs Armor Chance to Corrode enemies Give Sick 3.7x Weapon Zoom</p>

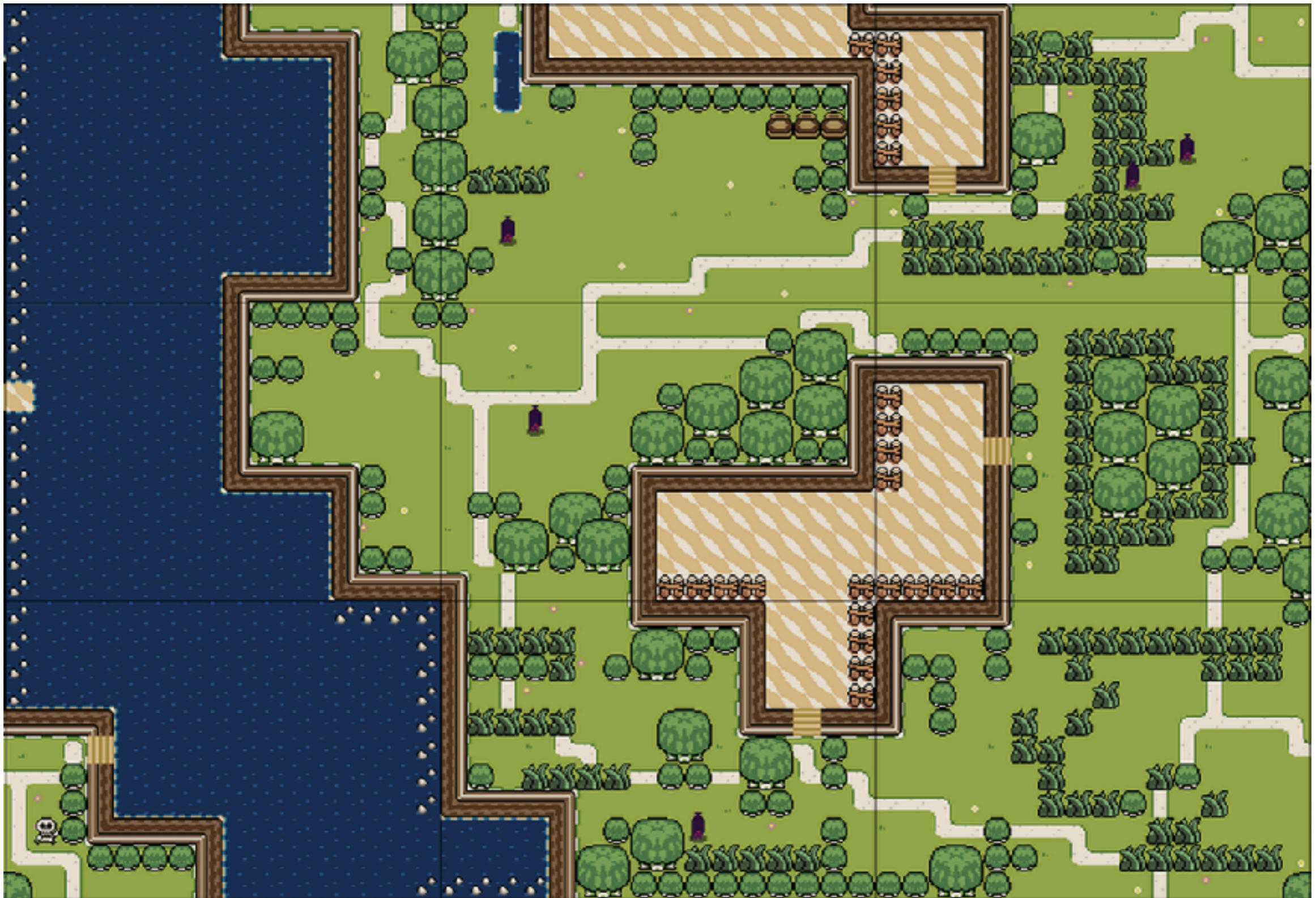
We can build gun generators with pre-made effects!

Or...

Or we can take the plunge on the other side

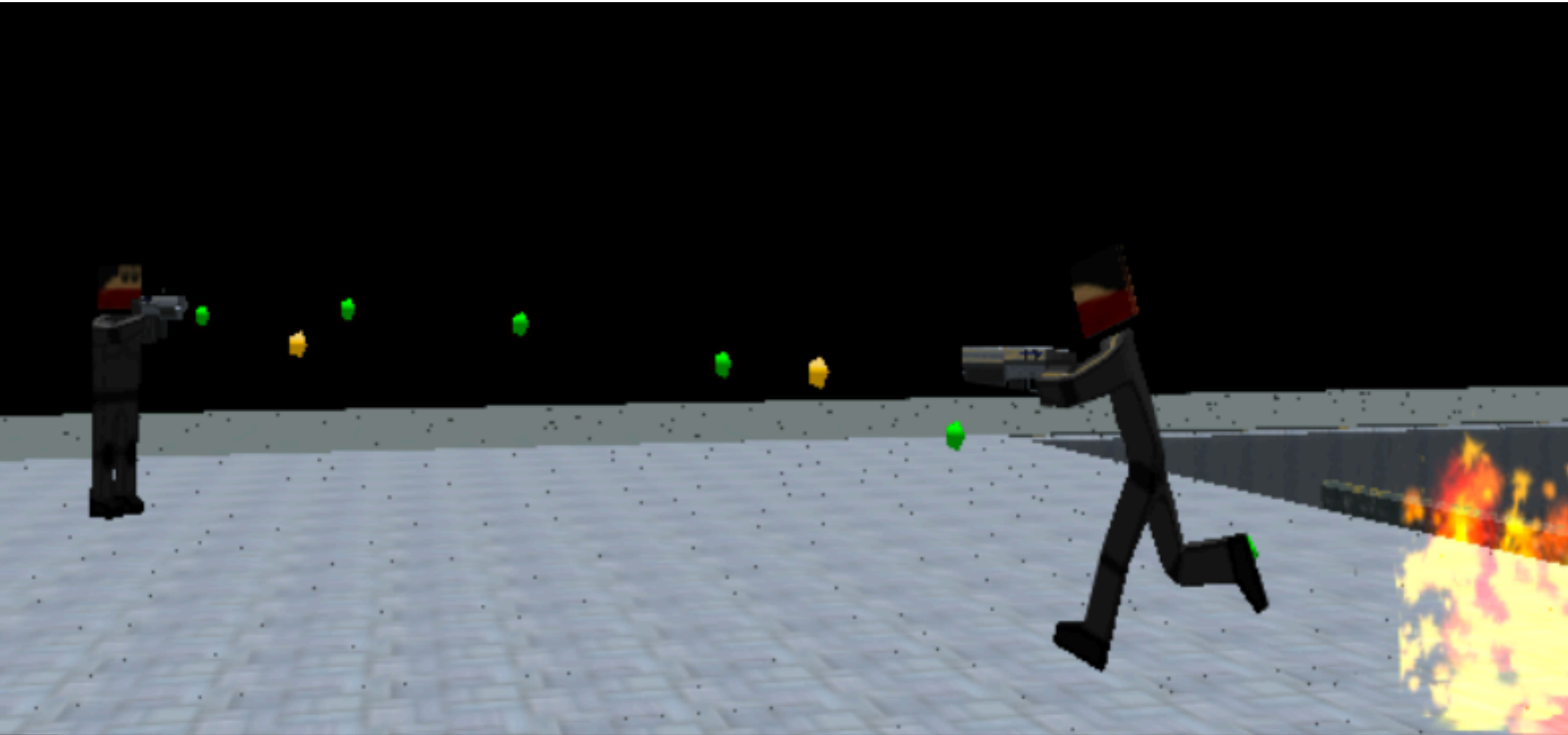


Or we can take the plunge on the other side



<http://tinyurl.com/lennasinception>

We can scout out into fresh territory

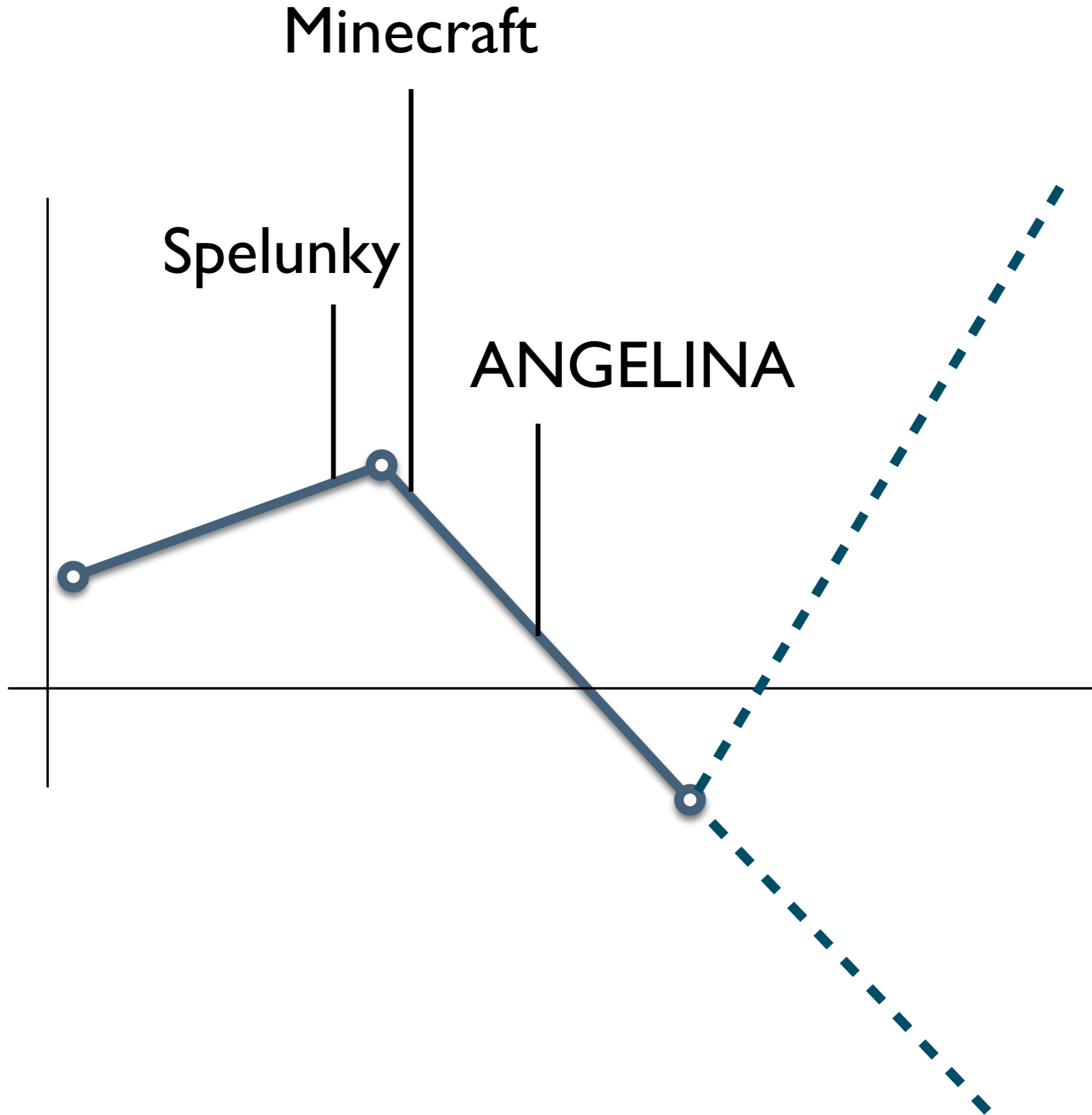


(Great work by Eric McDuffee and Alex Pantaleev)

“ “ An interesting weapon that the game generated had a projectile speed slower than the running speed of a player, a low gravity effect on them, high damage, and a very high magazine capacity. **This turned out to be a nearly perfect defensive weapon**, since a player could use it to blanket a hallway with slow moving projectiles, then switch to the other equipped weapon and move in the opposite direction, knowing that no enemy could sneak from behind.

What Lies Ahead?

Awesomeness



A Puzzling Present



Press enter or click to begin!

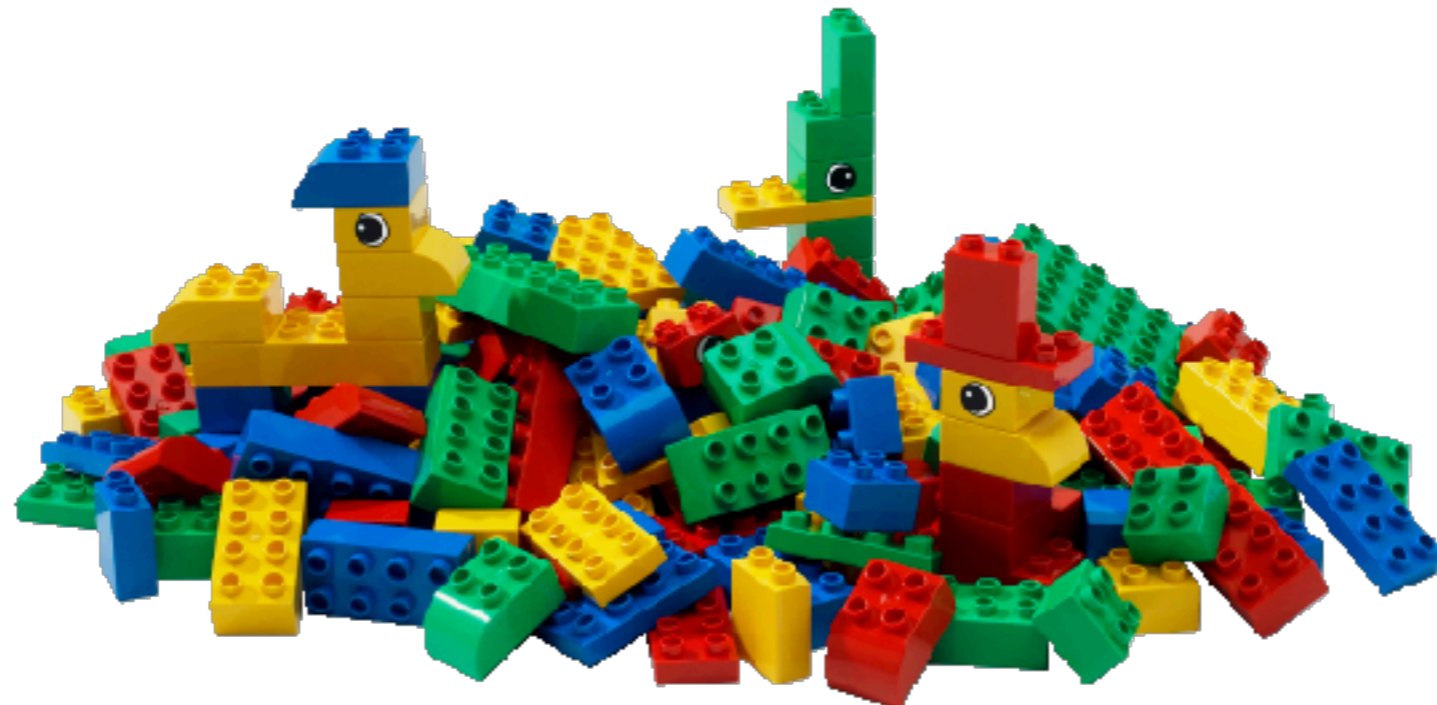
Aim: Generate *Verbs*

Previously, on *ANGELINA*

A rule is...

OBJECT + OBJECT = EFFECT + EFFECT + SCORE

RED + PLAYER = KILL + NOTHING + 5



Previously, on *ANGELINA*

A powerup is...

```
SPECIAL_VAR += FIXED_CHANGE
```


```
jumpHeight += 500
```



**This isn't how I write
game code.**

This isn't how I write
game **code**.


```
public void update(){
    if(FlxG.keys.SPACEBAR){
        player.velocity.y = -jumpSpeed;
    }
}
```



Some variable

a change

Handpicked?

`player.jumpHeight`

`level.gravity`

`level.lockStatus`



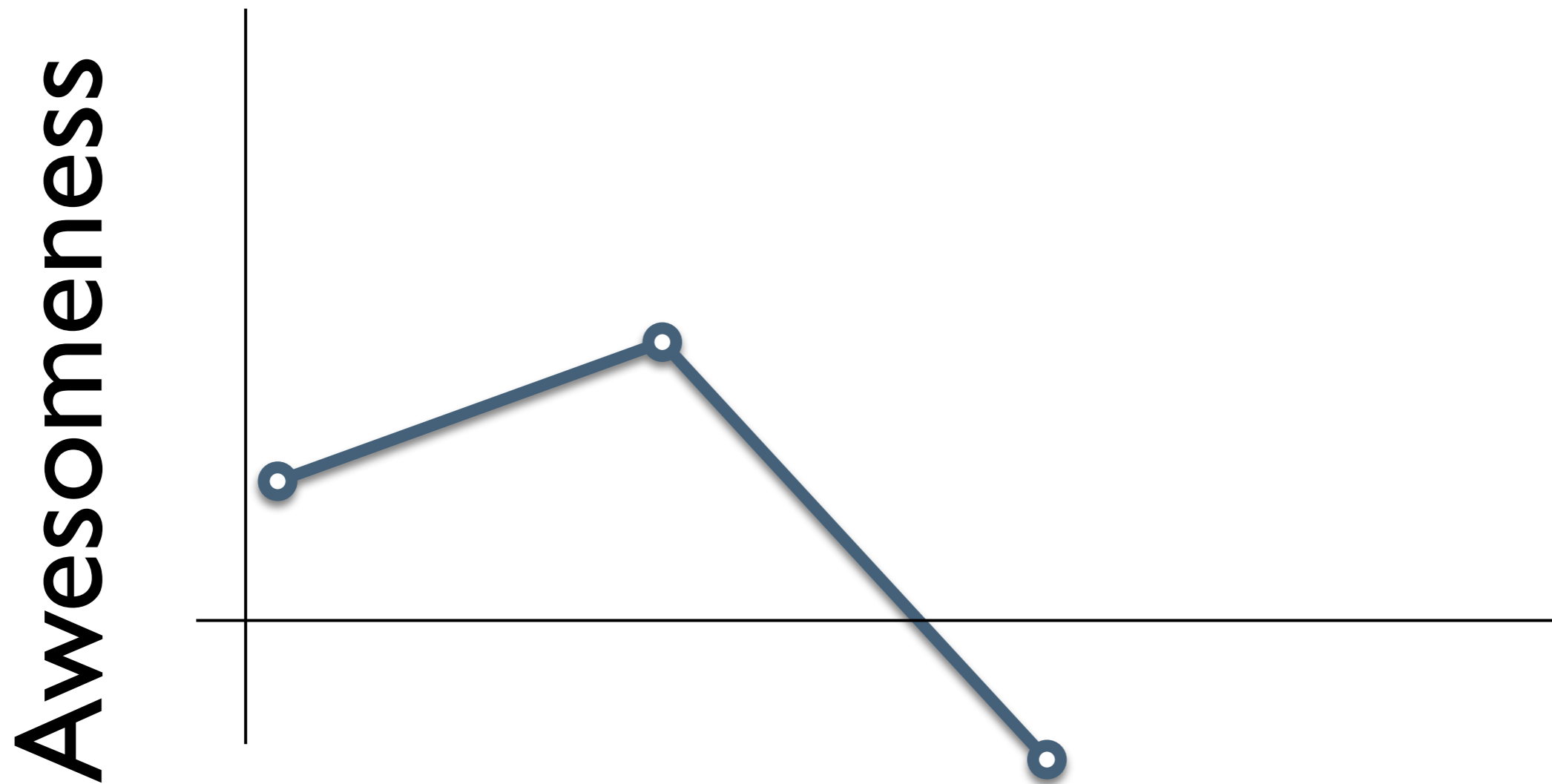
player.velocity.x
player.acceleration.y
FlxG.timeScale
player.health
Reg.exit.scale.x
player.elasticity
player.y
player.velocity.y
Reg.exit.x
player.jumpHeight
player.damage
Reg.level.collision
player.scale.x

**Let's give the system
access to the game
engine!**

Let's generate a bunch of
(very simple) game mechanics

```
public void update(){  
    if(FlxG.keys.X){  
        player.velocity.y += 200;  
    }  
}
```

Definitely giving more independence, but...



Independence Of Software

```
public void update(){
    if(FlxG.keys.X){
        player.health = 0;
    }
}
```

Um...

```
public void update(){
    if(FlxG.keys.X){

        player.jumpHeight = 0;

    }
}
```

Uh...

```
public void update(){
    if(FlxG.keys.X){
        player.height = -1;
    }
}
```

Oh boy...

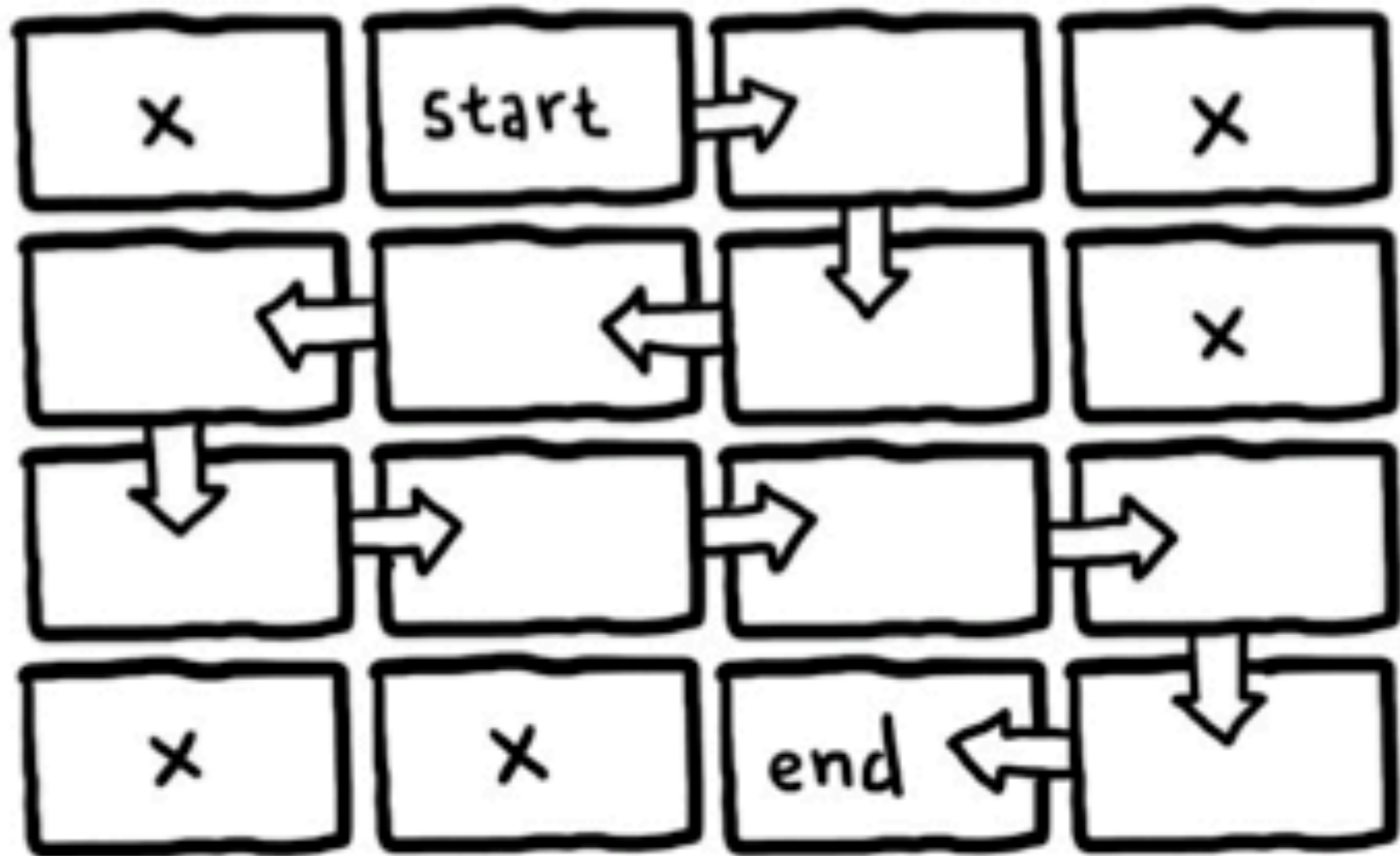
**How do you stop your system
from making bad things?**

The 'Bad Thing' Problem

Solution #1:

Don't make bad things





The 'Bad Thing' Problem

Solution #2:

Make bad things, but recognise it.

“Generate-and-Test”

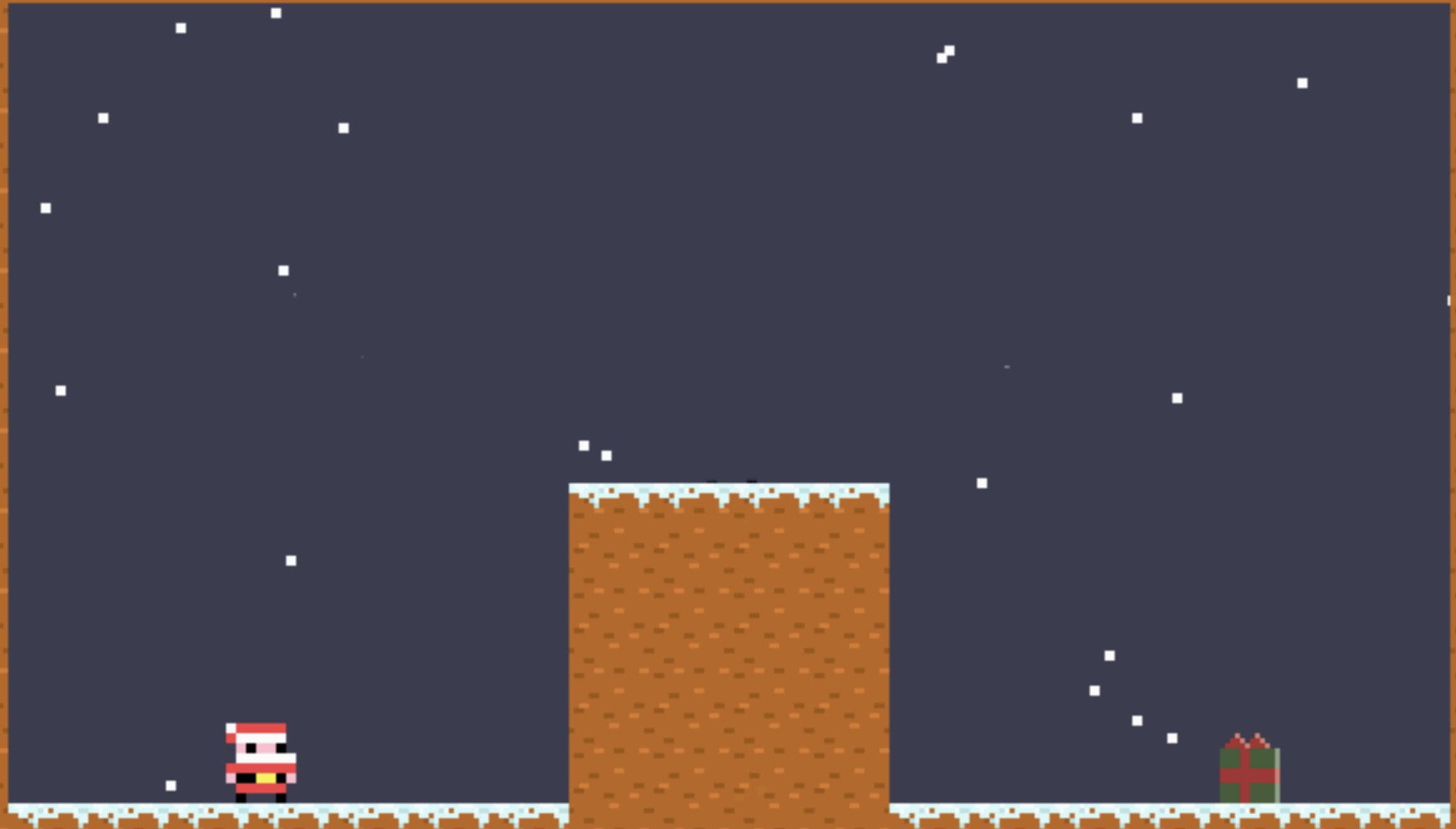
**How do you test a game
mechanic?**

**How does a piece of software
test a game mechanic?**

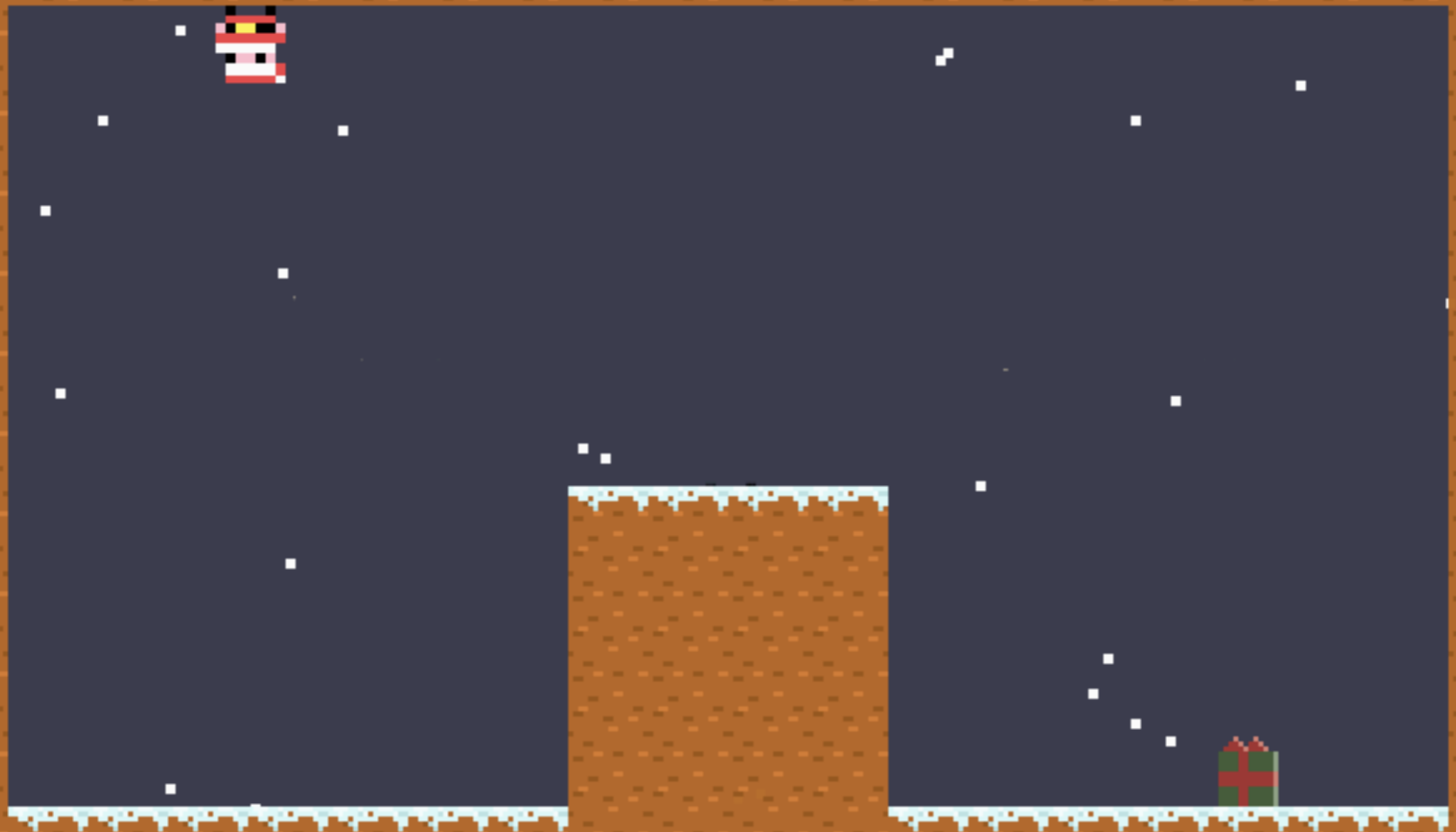
~~Fun~~

~~Meaningful~~

Useful!



```
player.acceleration.y *= -1;
```



```
player.acceleration.y *= -1;
```

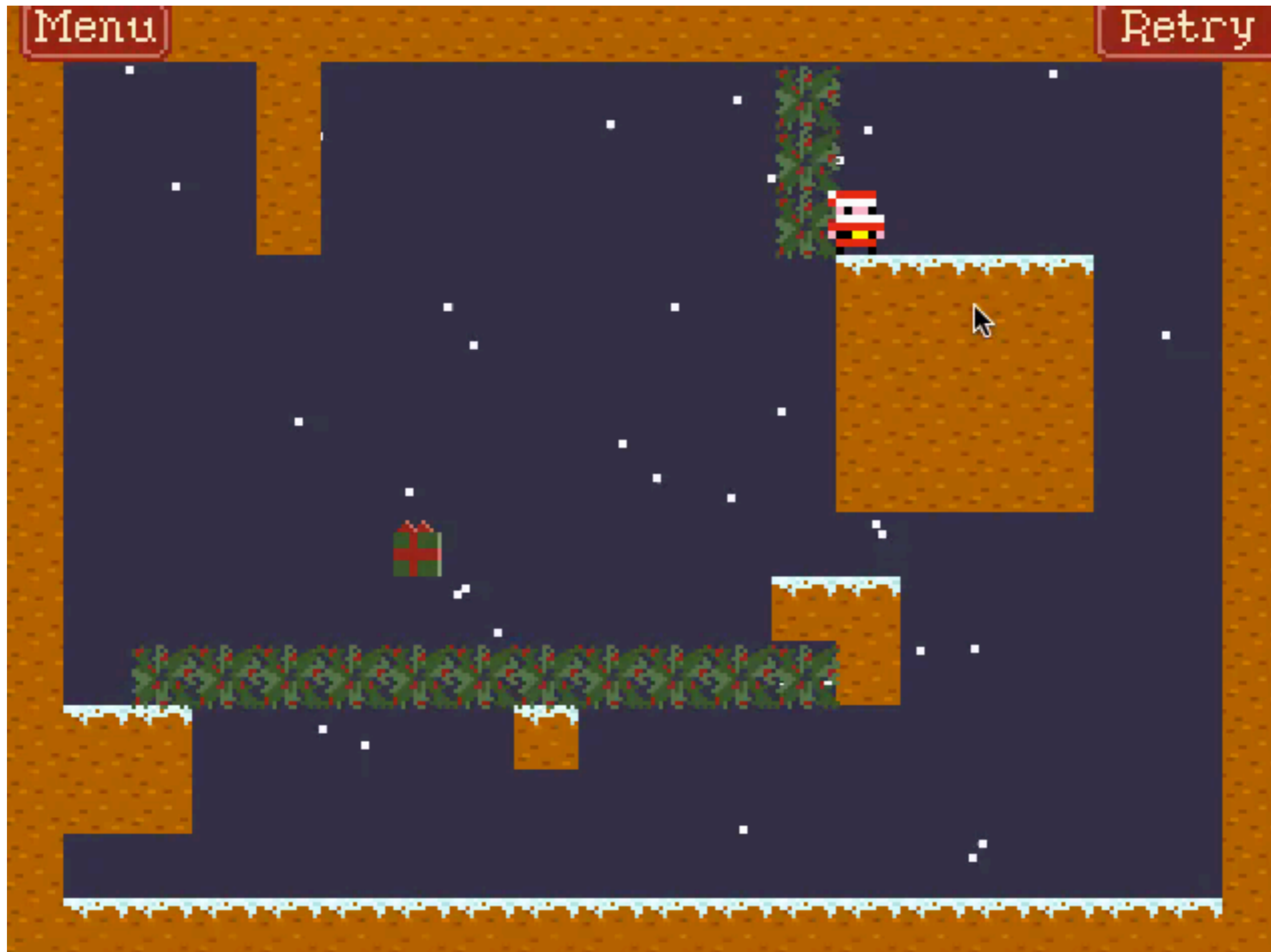


```
player.acceleration.y *= -1;
```

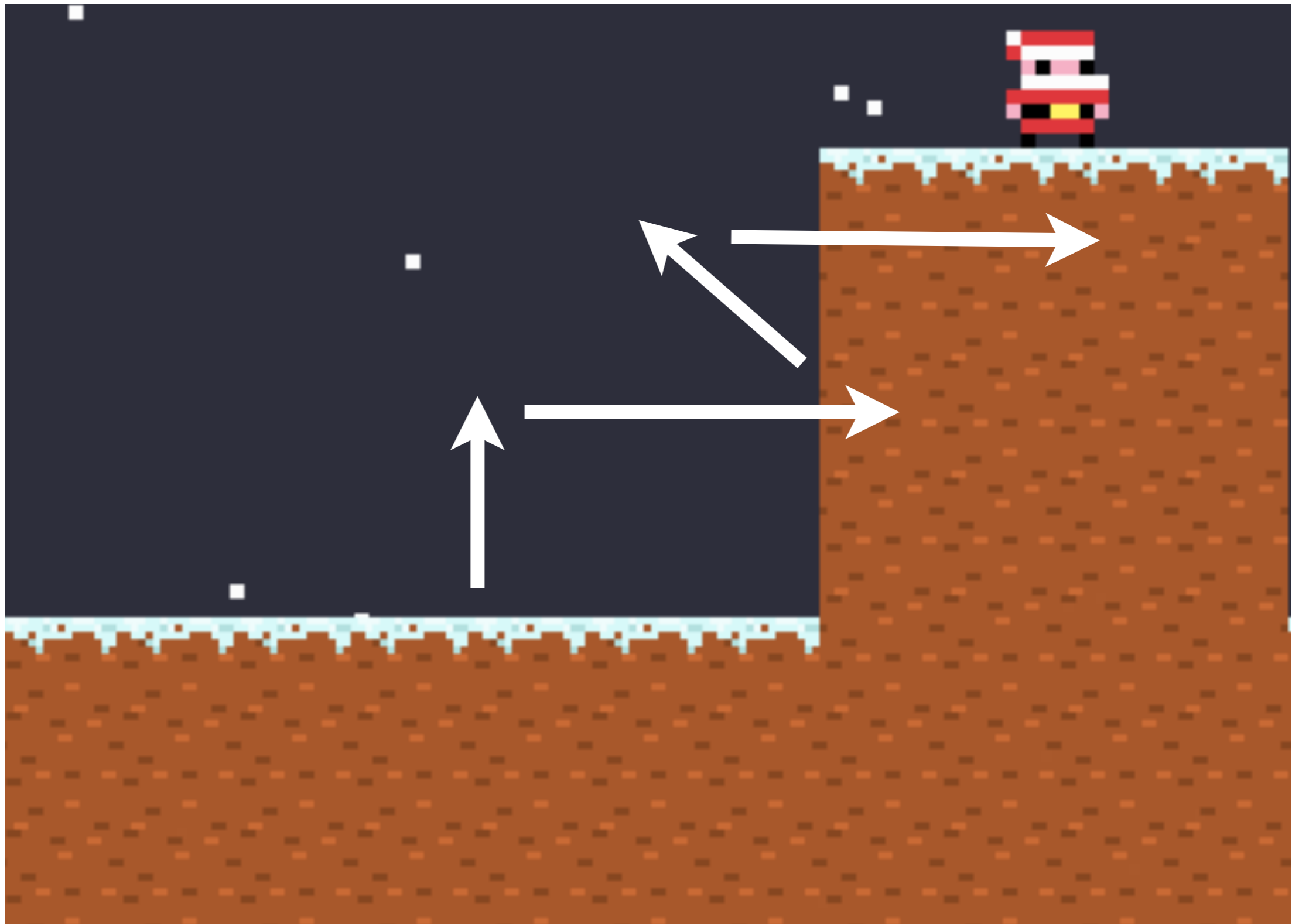


```
player.acceleration.y *= -1;
```

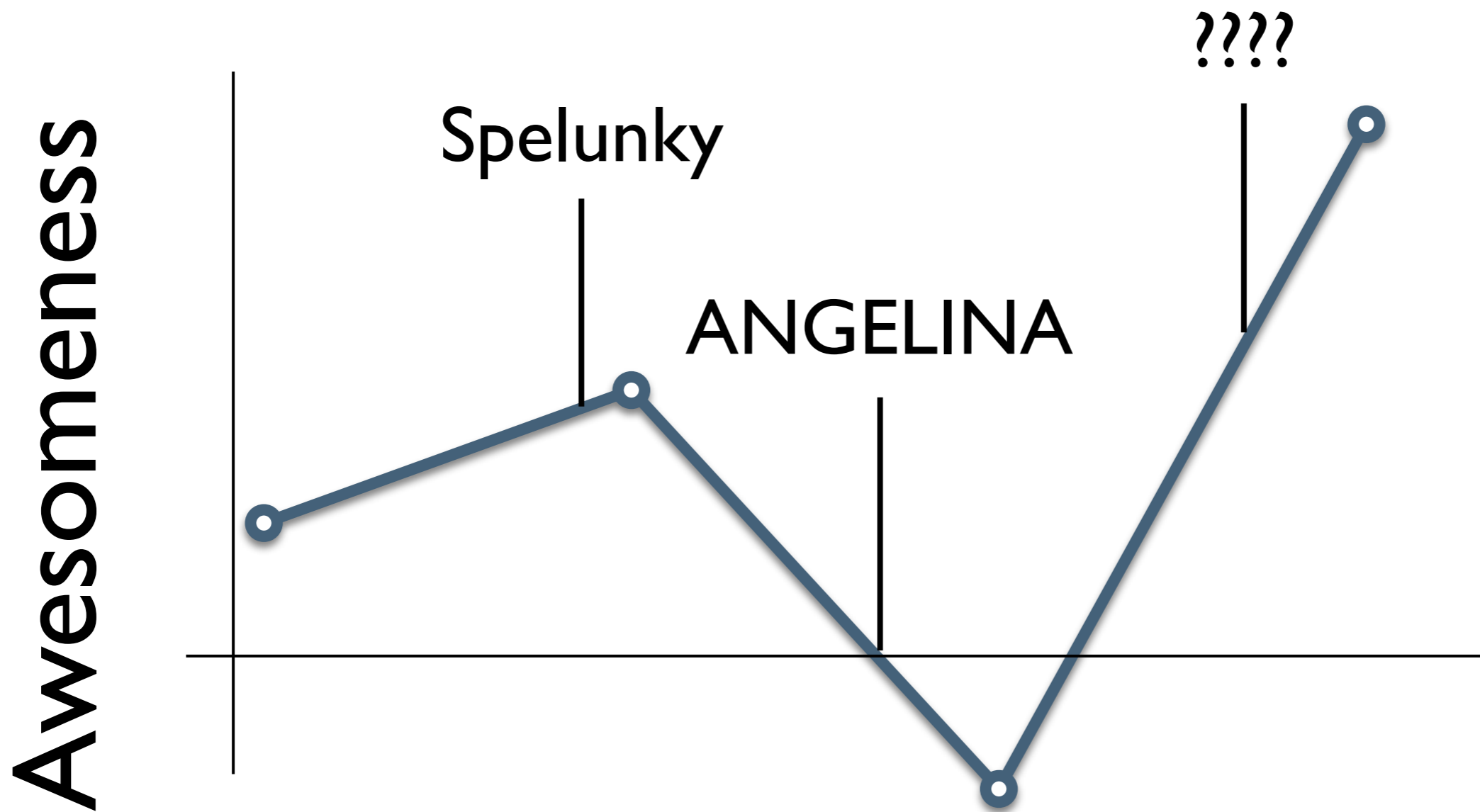
But wait! There's more.



```
player.elasticity = 1f;
```

This was only possible by making the system independent!



Independence Of Software

The Latency Problem



No-one knows what might be over there...

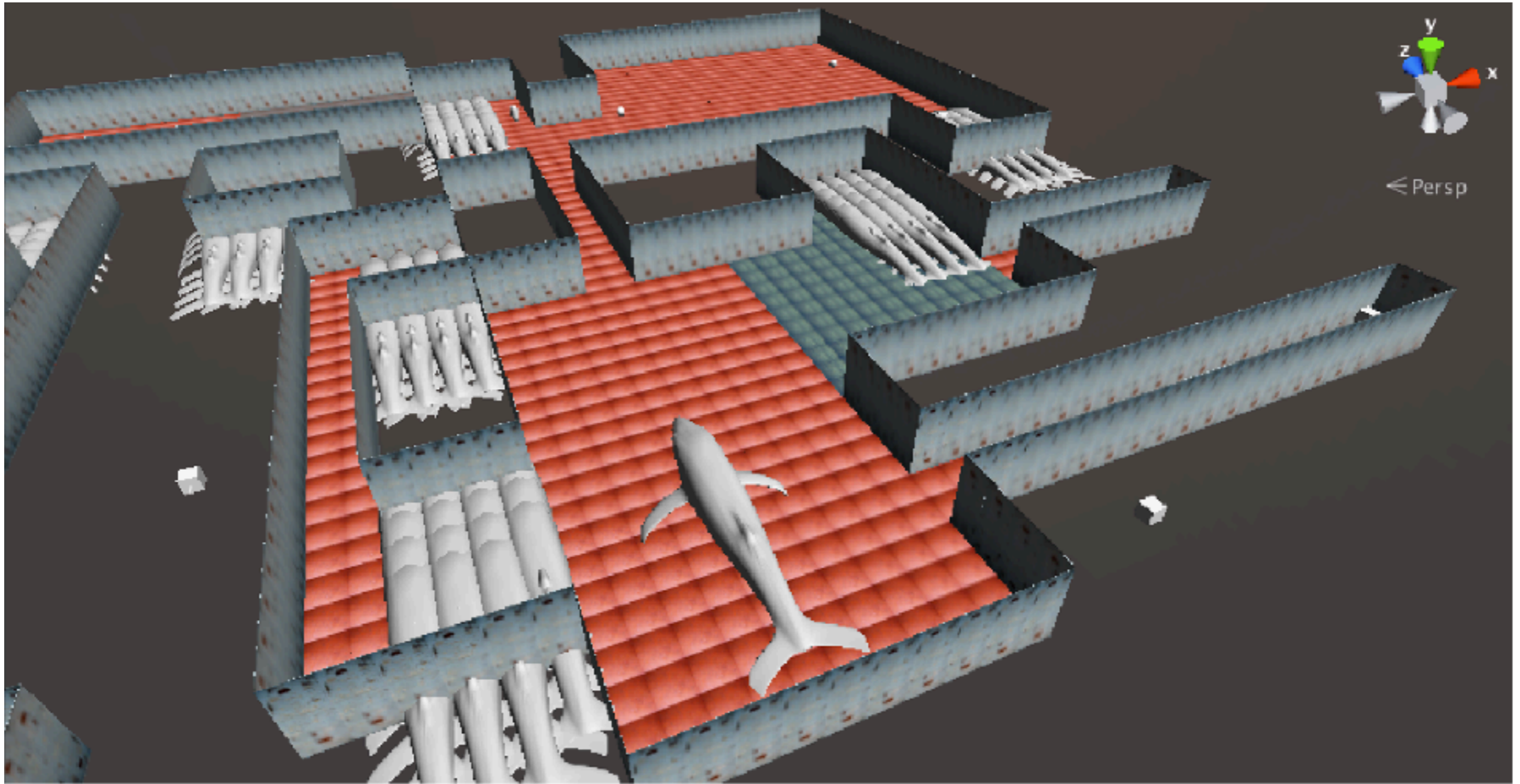


We need people to map it out for us!



A SLEDGE PARTY FROM THE ALBERT MAKING A PUSH FOR THE POLE.

It won't be comfy or glamorous



You'll make crazy, weird, nonsensical stuff!



But you'll see new things!



The future is just over the next valley



Let's go find it together!

Thanks for listening!

Also thanks to:

Tom Coxon

Derek Yu

Azalea Raad

Tony Veale

www.gamesbyangelina.org

@mtrc

@angelinasgames

Go forth and generate!

