Creating worlds.

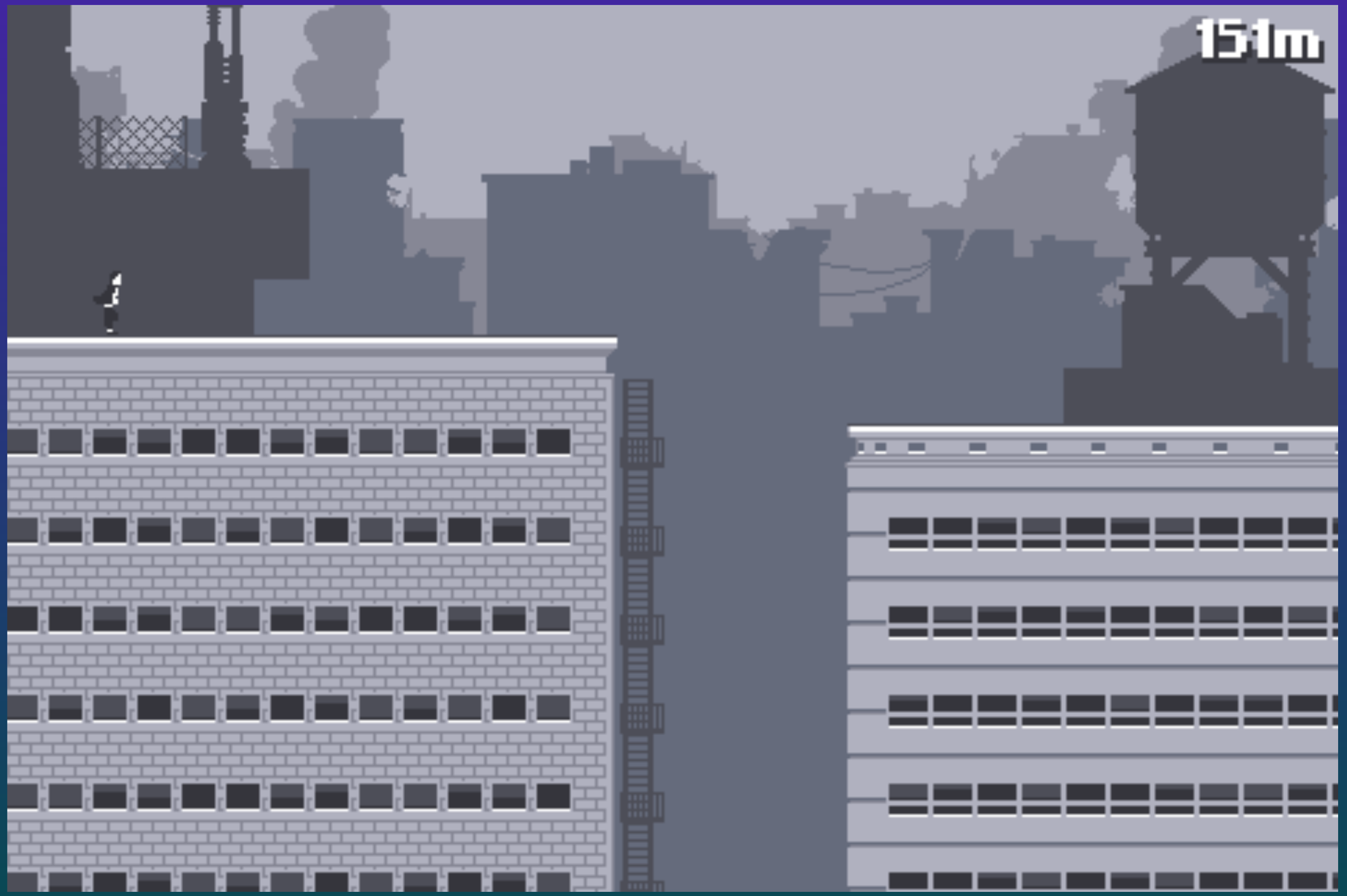
Part 2

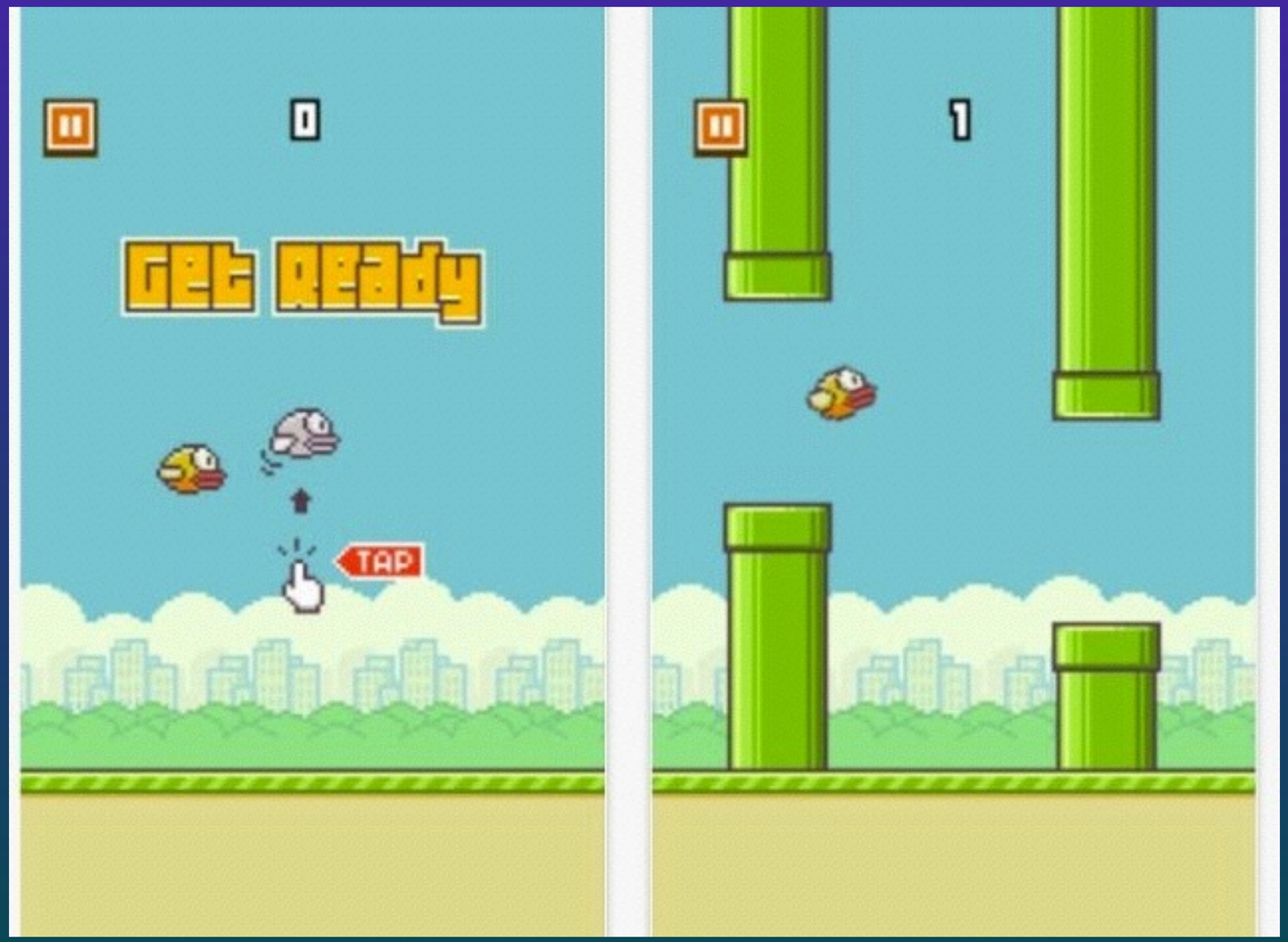
Creating levels.

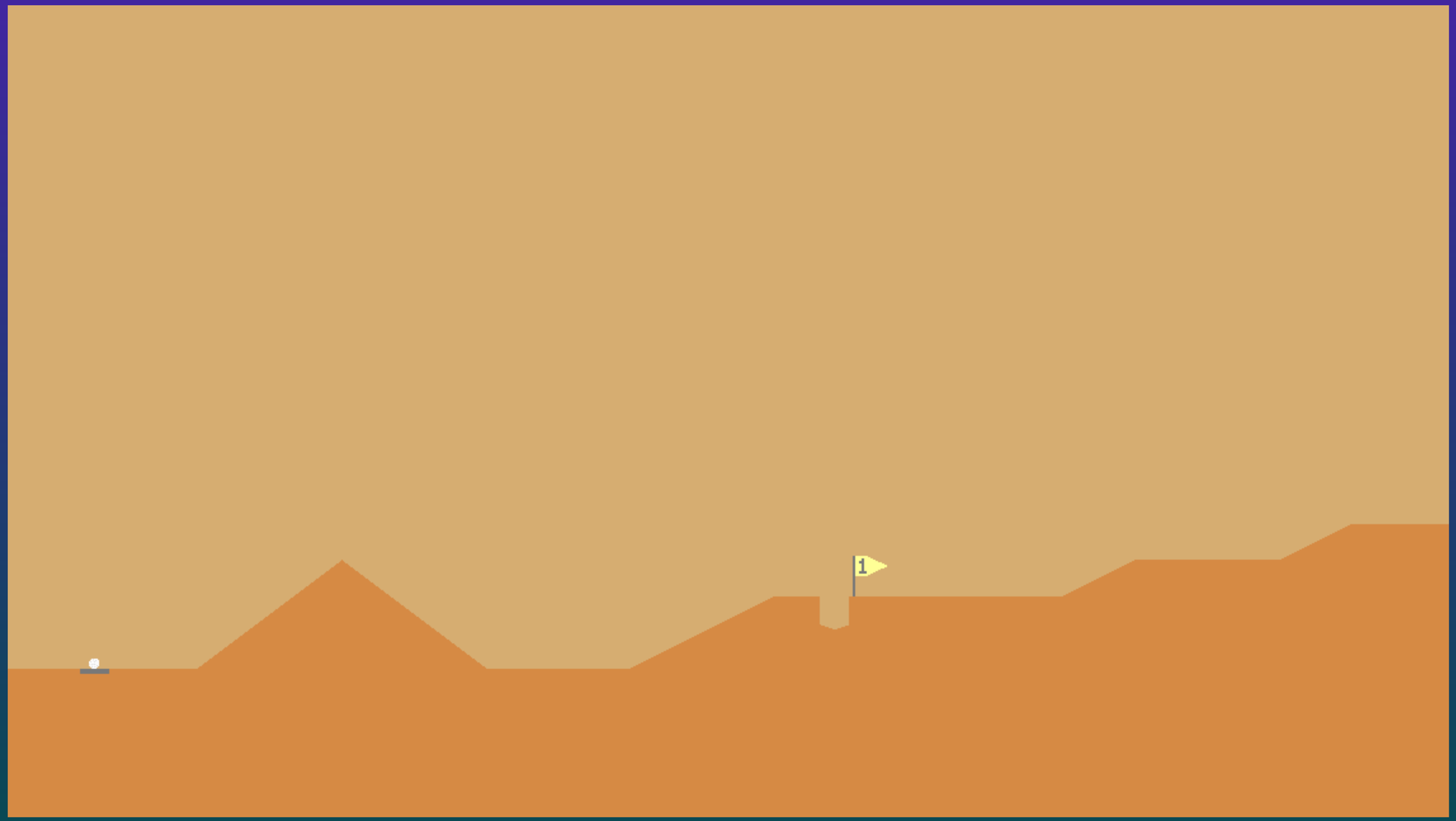
Procedural level generation.

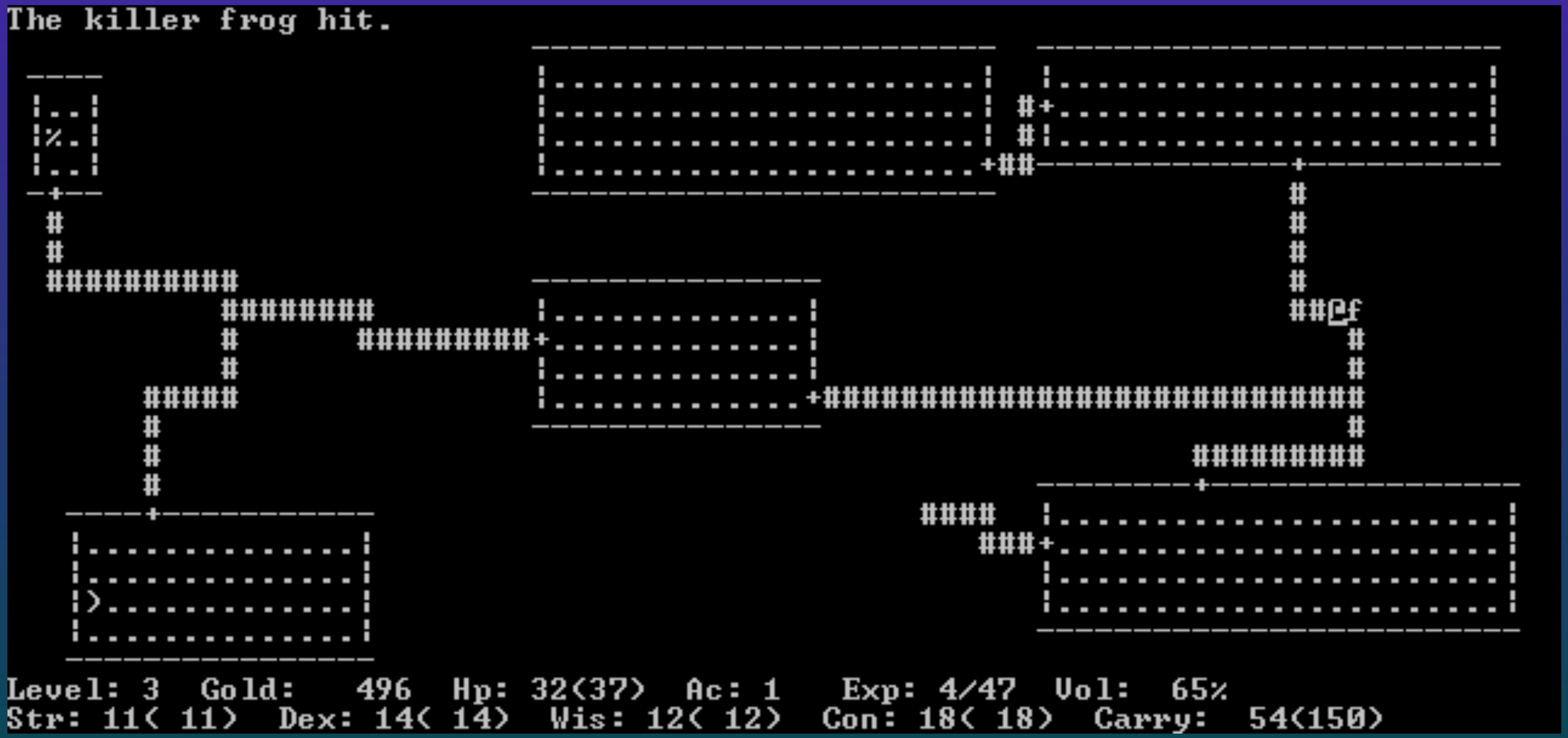

Terraria


1
4
4
0


151m


0
Get Ready
TAP
1

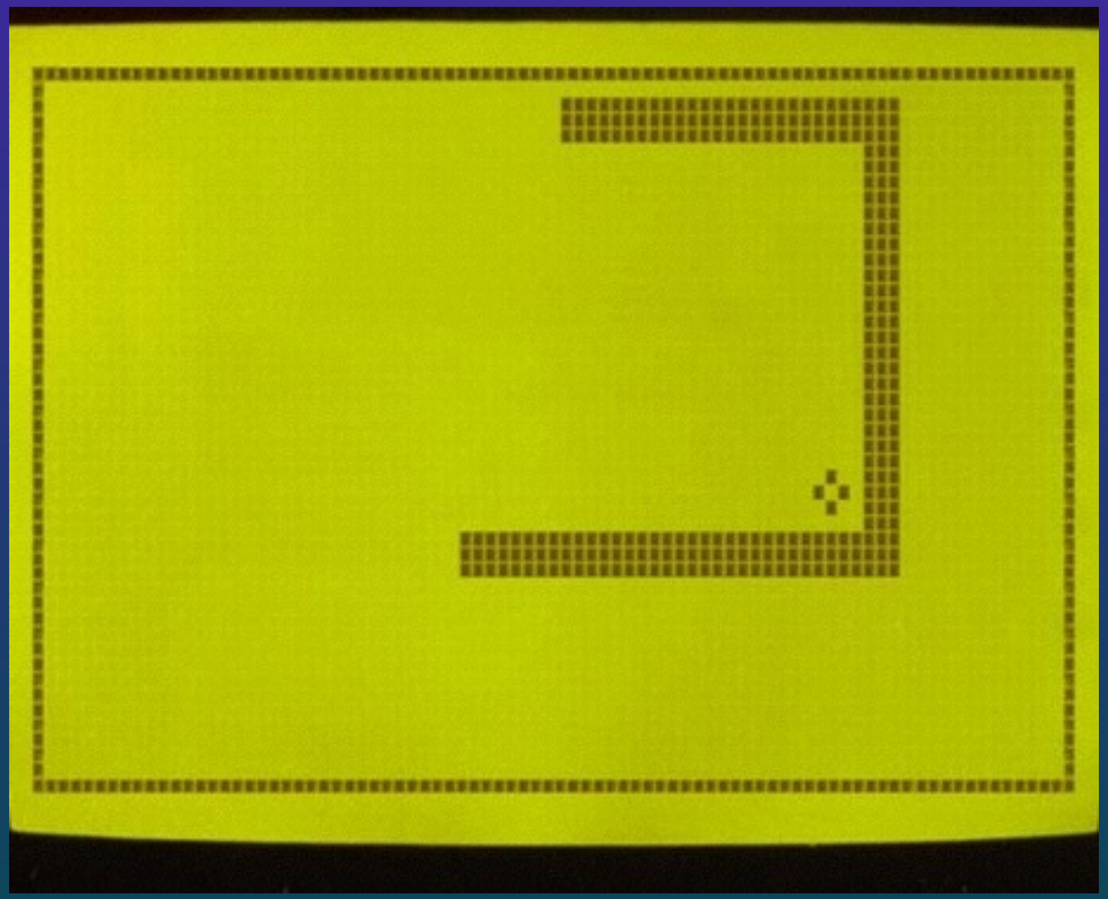

1

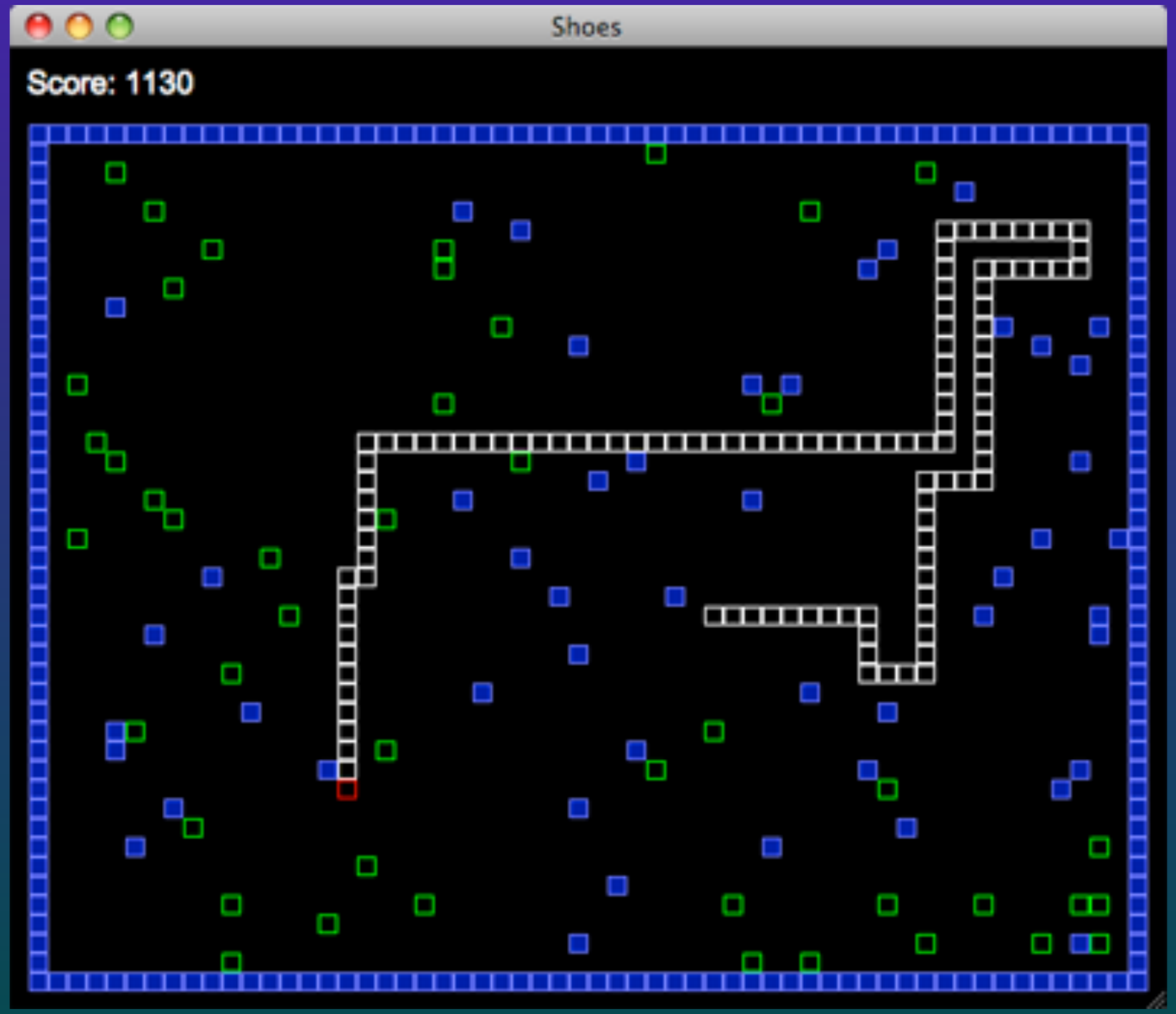

The killer frog hit.
Level: 3 Gold: 496 Hp: 32(37) Ac: 1   Exp: 4/47 Vol: 65%
Str: 11(11) Dex: 14(14) Wis: 12(12) Con: 18(18) Carry: 54(150)

An overview of procedural generation examples.

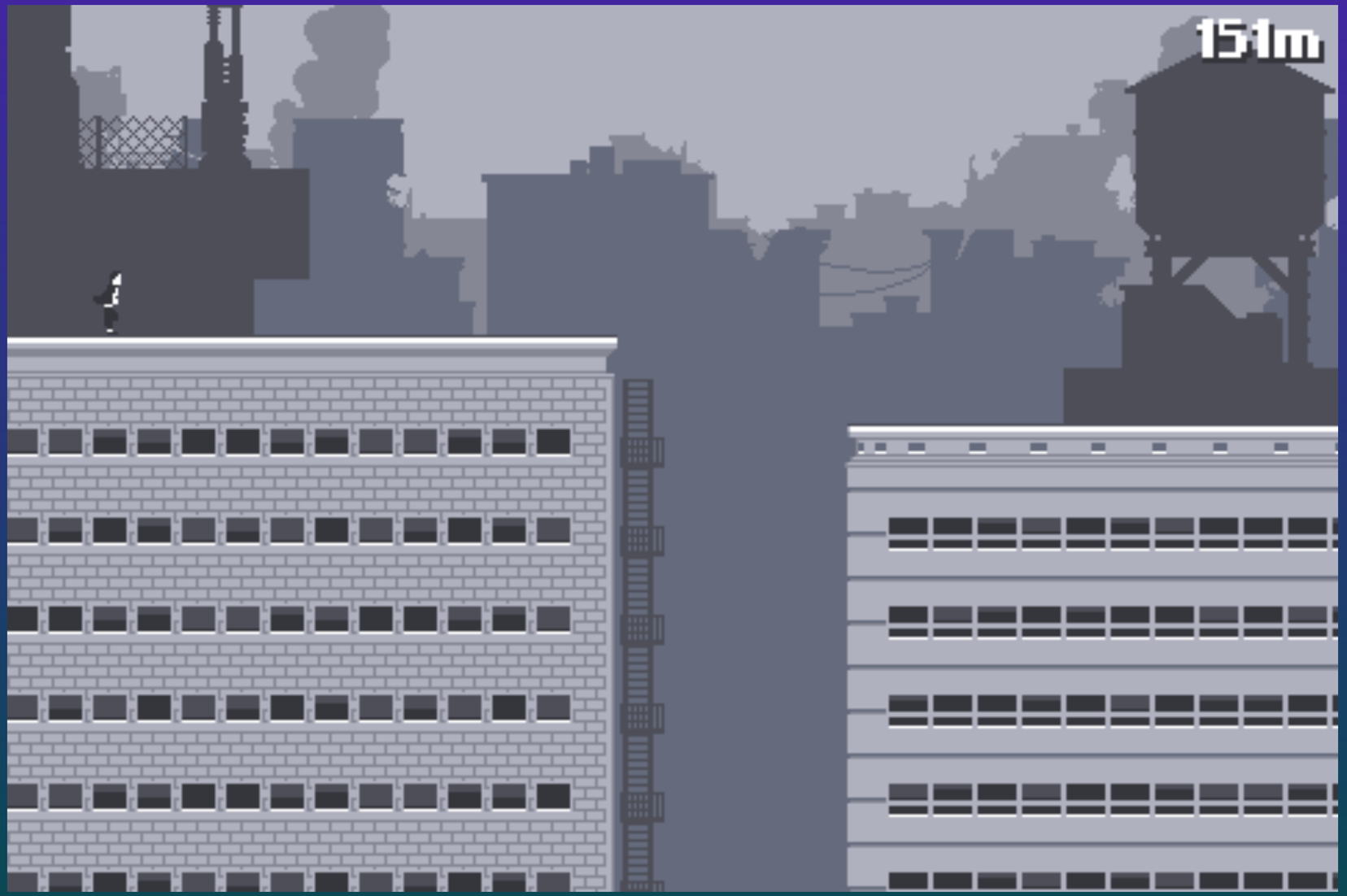
Snake.

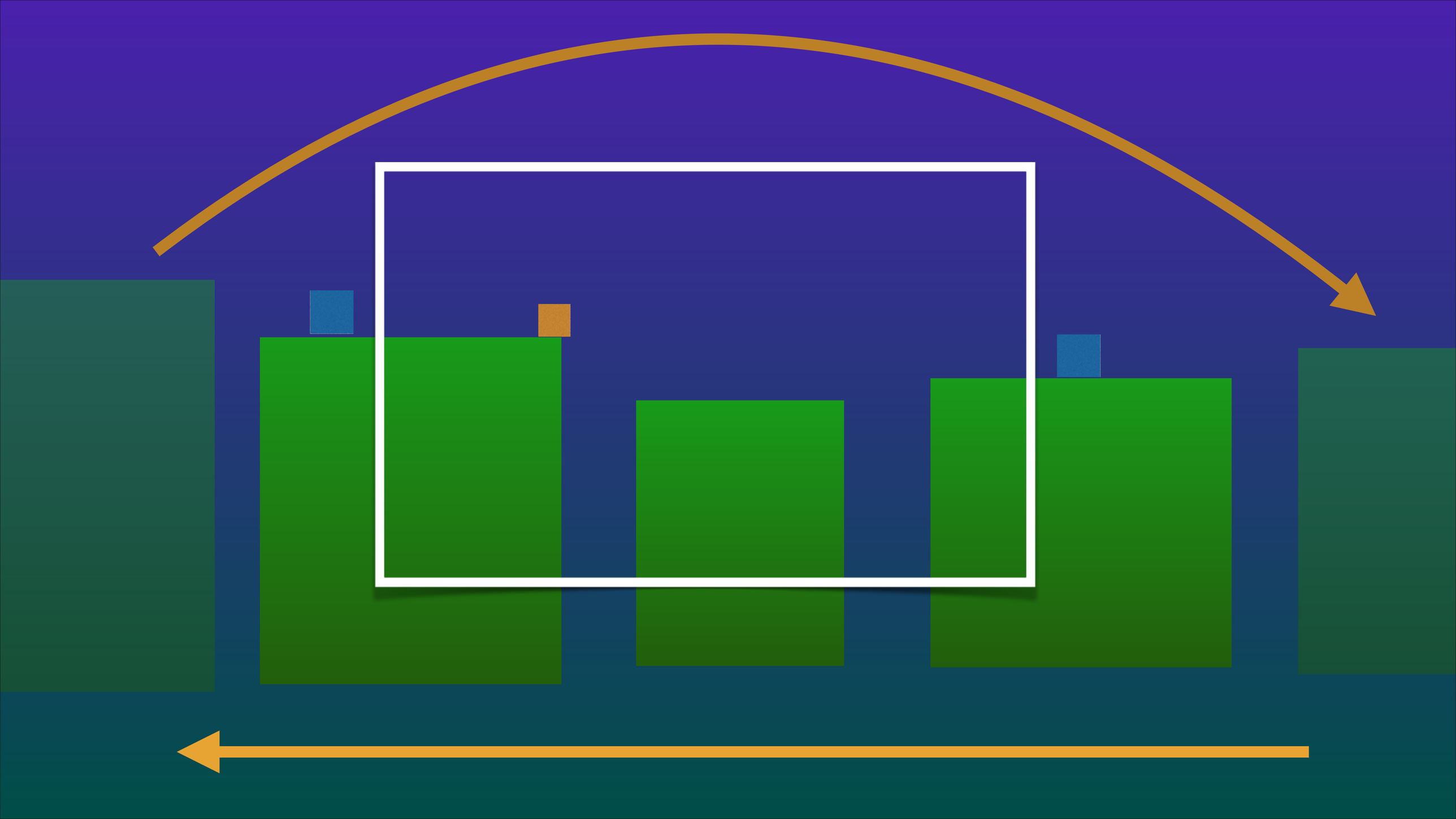

NOKIA




Shoes
Score: 1130

Canabalt.


151m

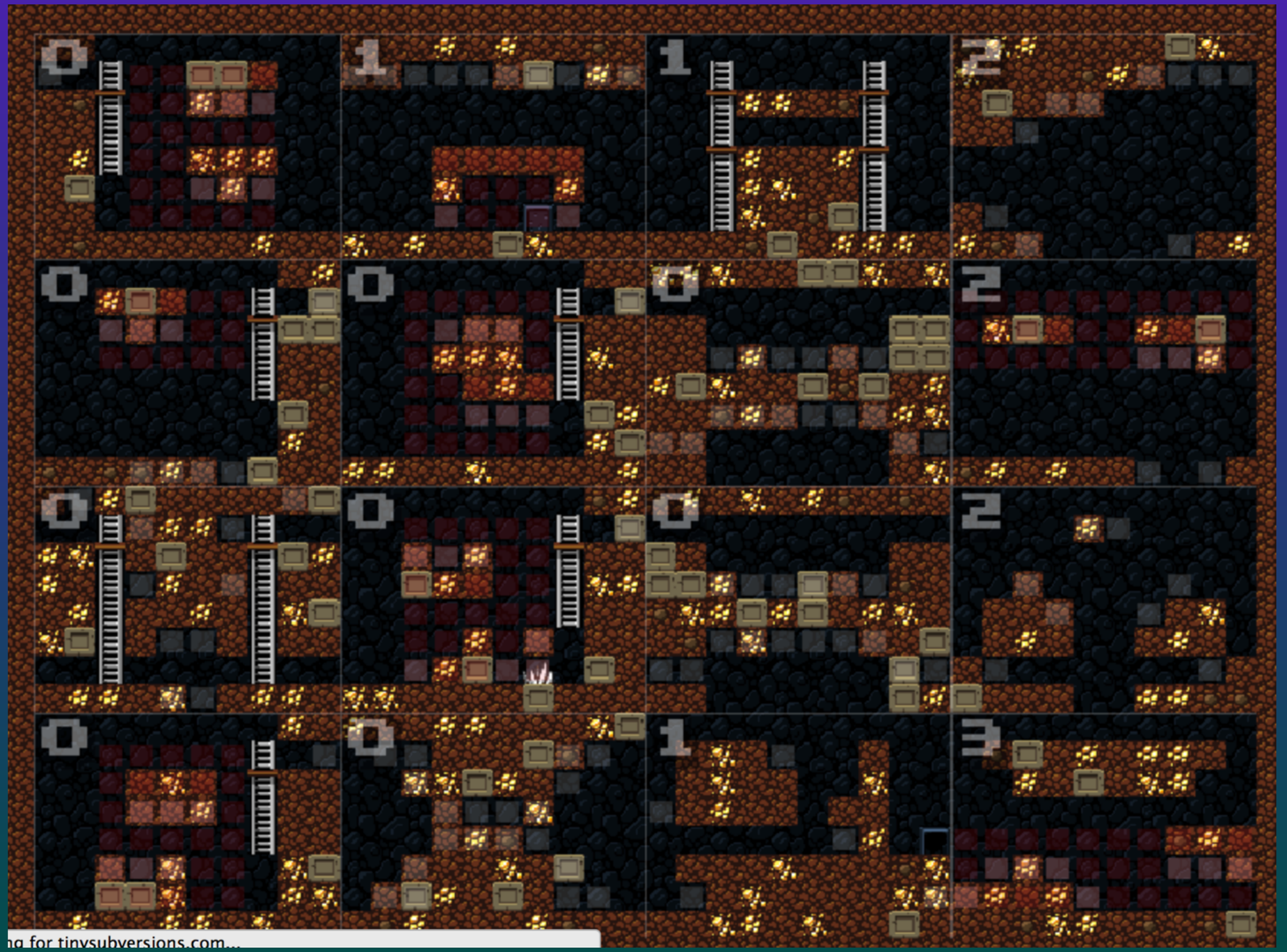


Tuning Canabalt

http://www.gamasutra.com/blogs/AdamSaltsman/20100929/88155/Tuning_Canabalt.php

Spelunky.


1
4
4
0

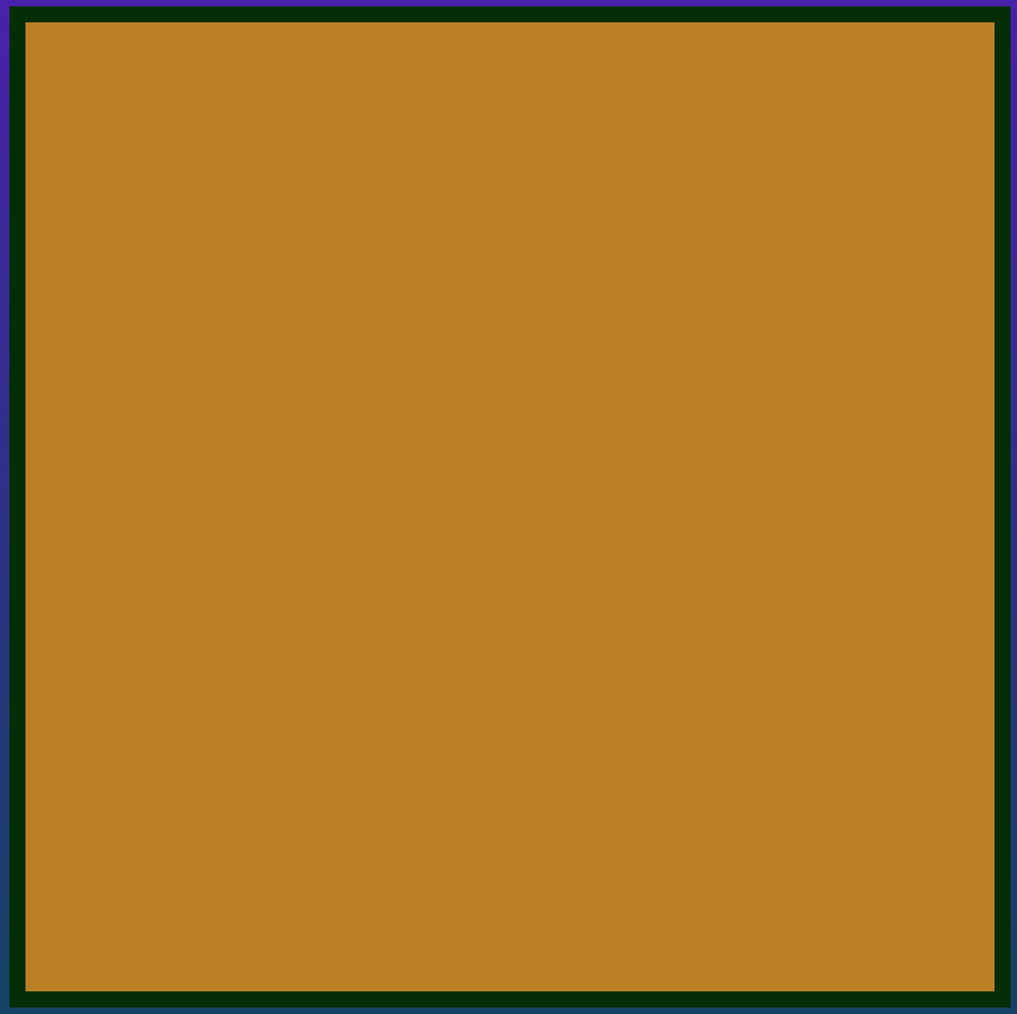

0
1
1
2
0
0
0
2
0
0
0
2
0
0
1
3

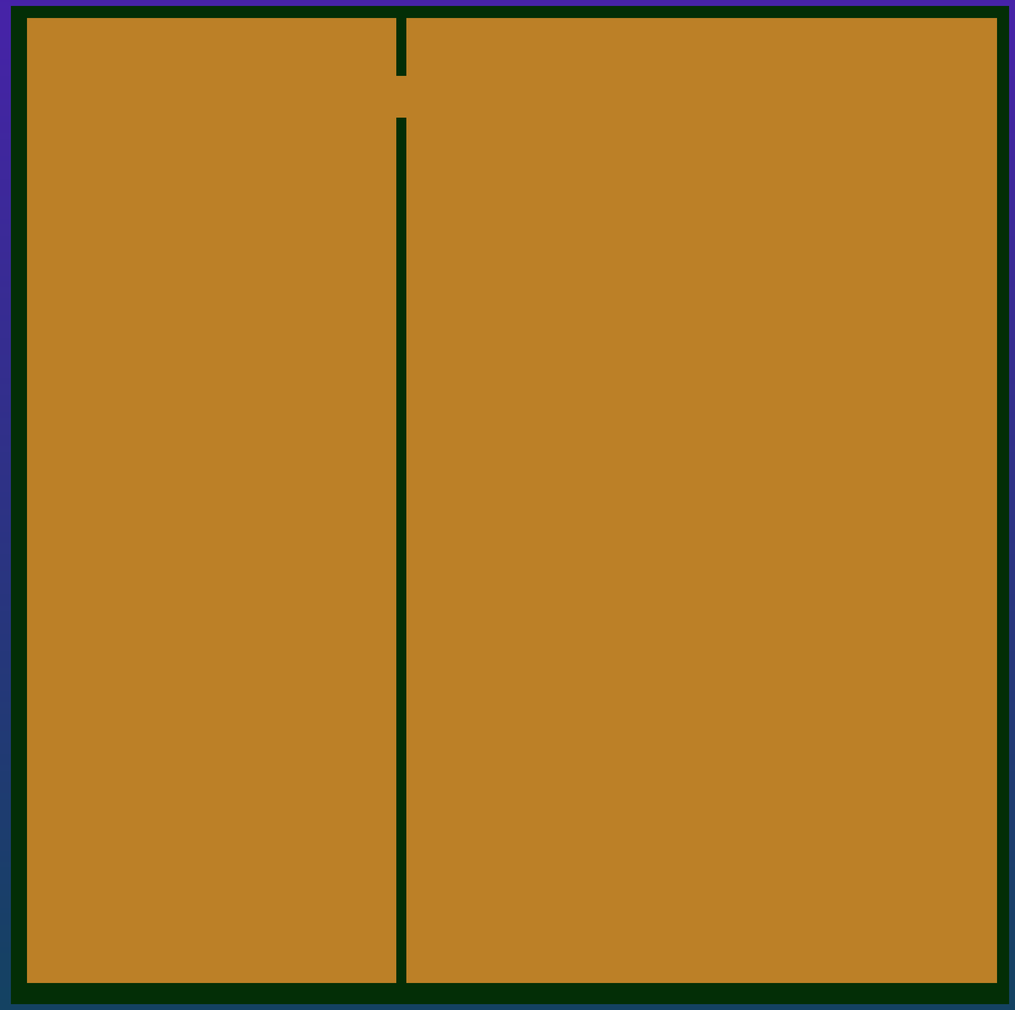
Level generation in Spelunky.

http://tinysubversions.com/spelunkyGen/

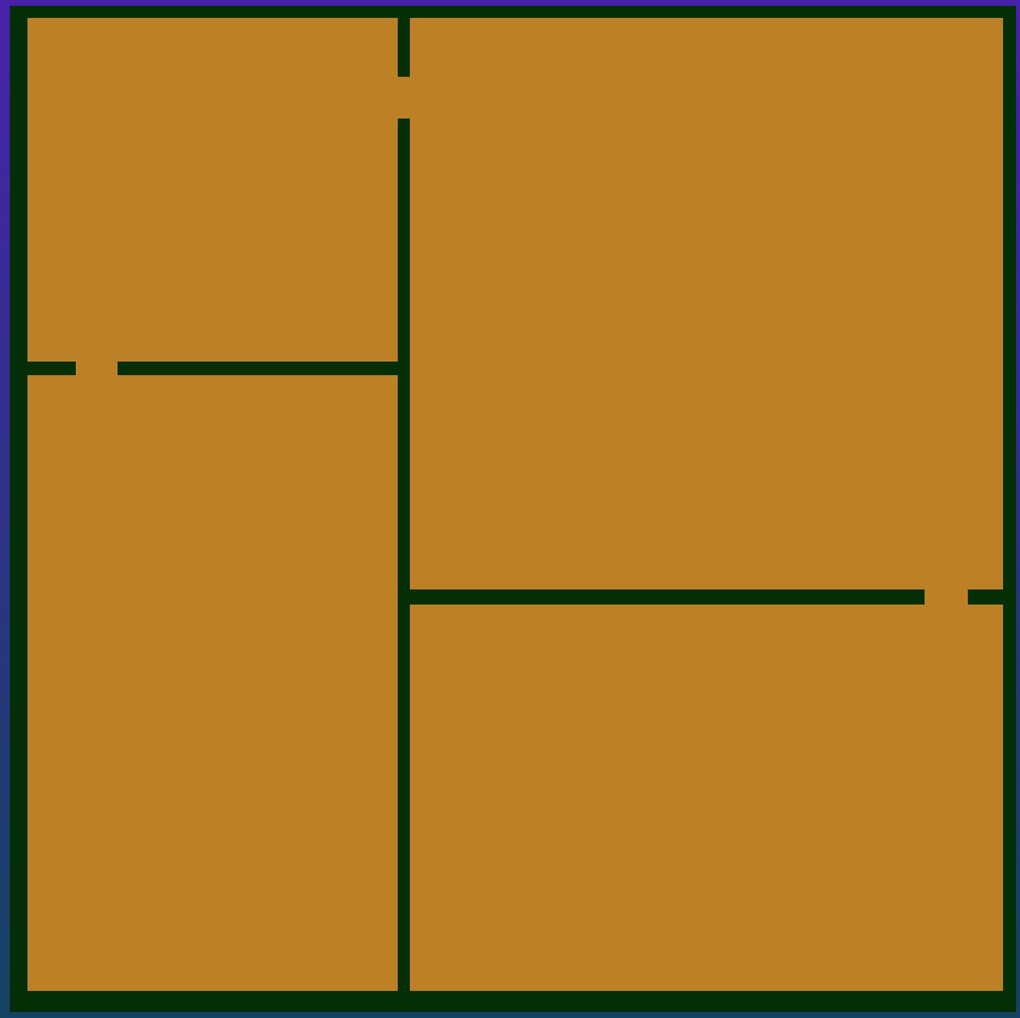
Bitworld.


GOLD:10

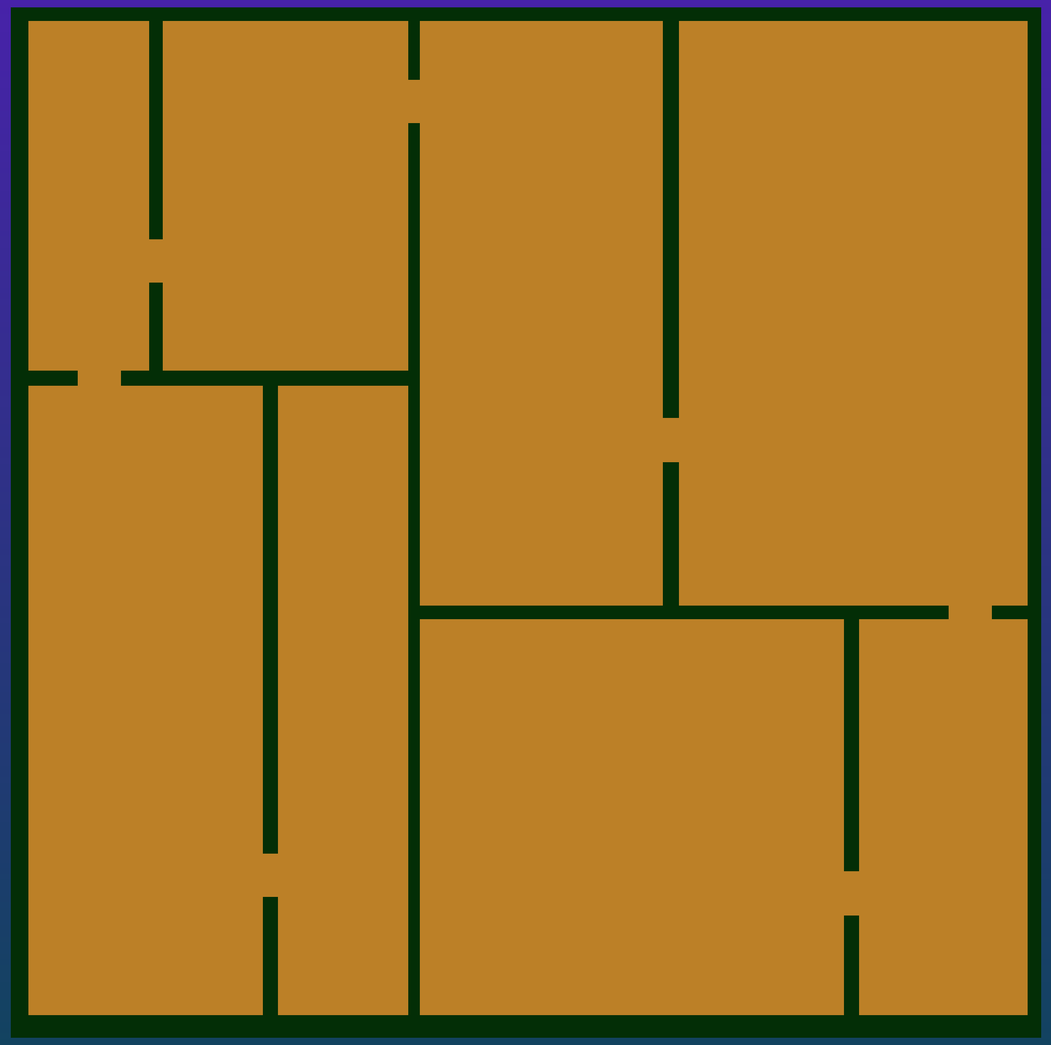




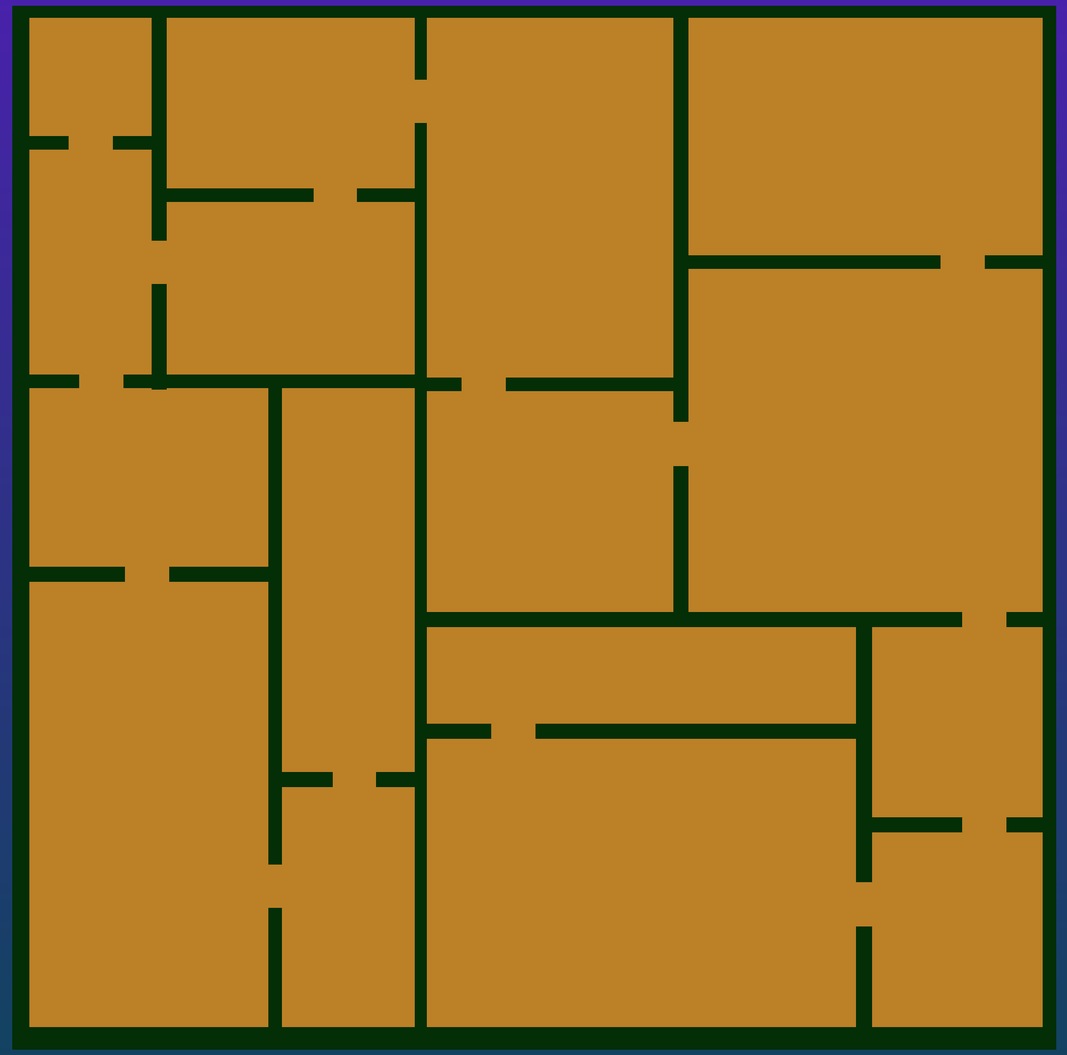
Divide into two rooms of random width and connect them together.



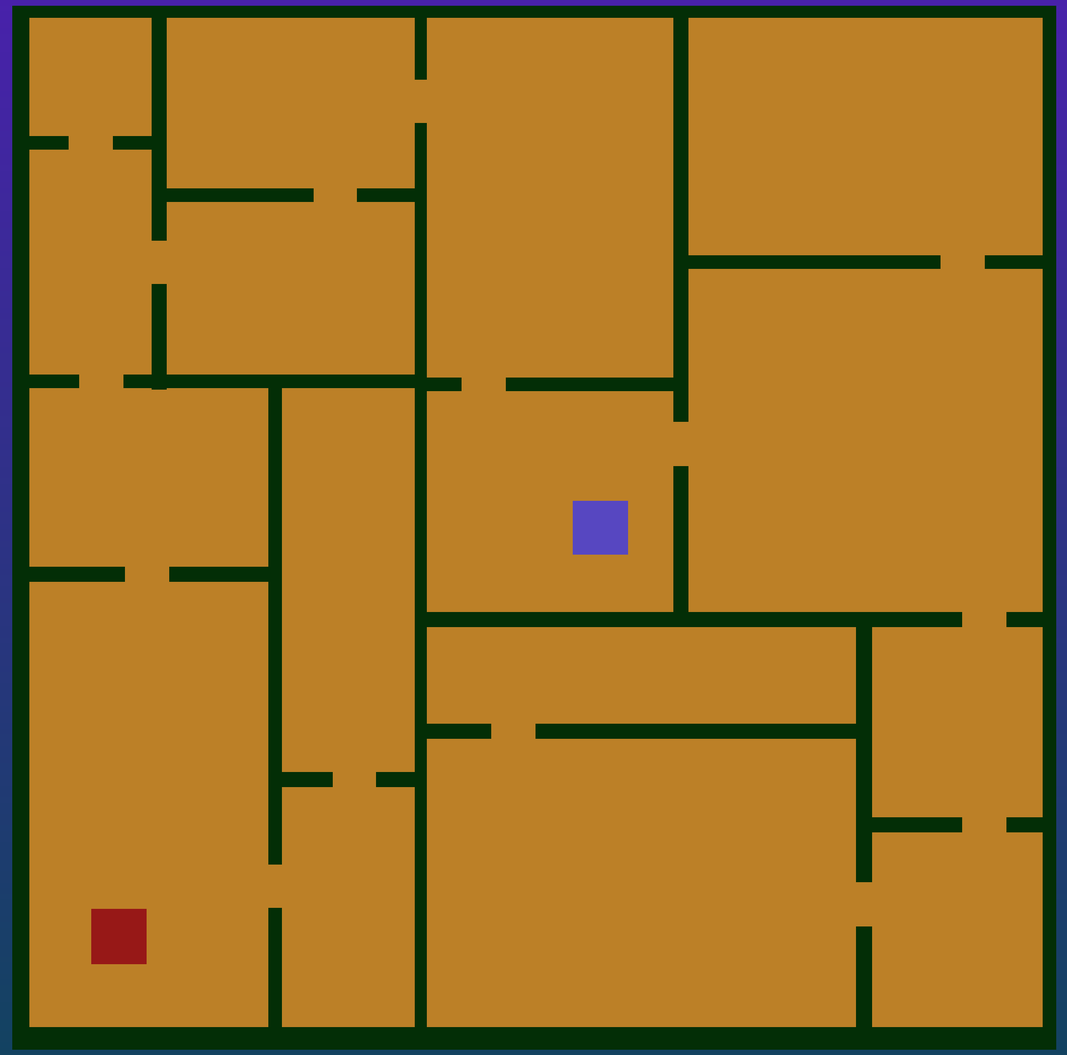
Do the same for the new rooms.



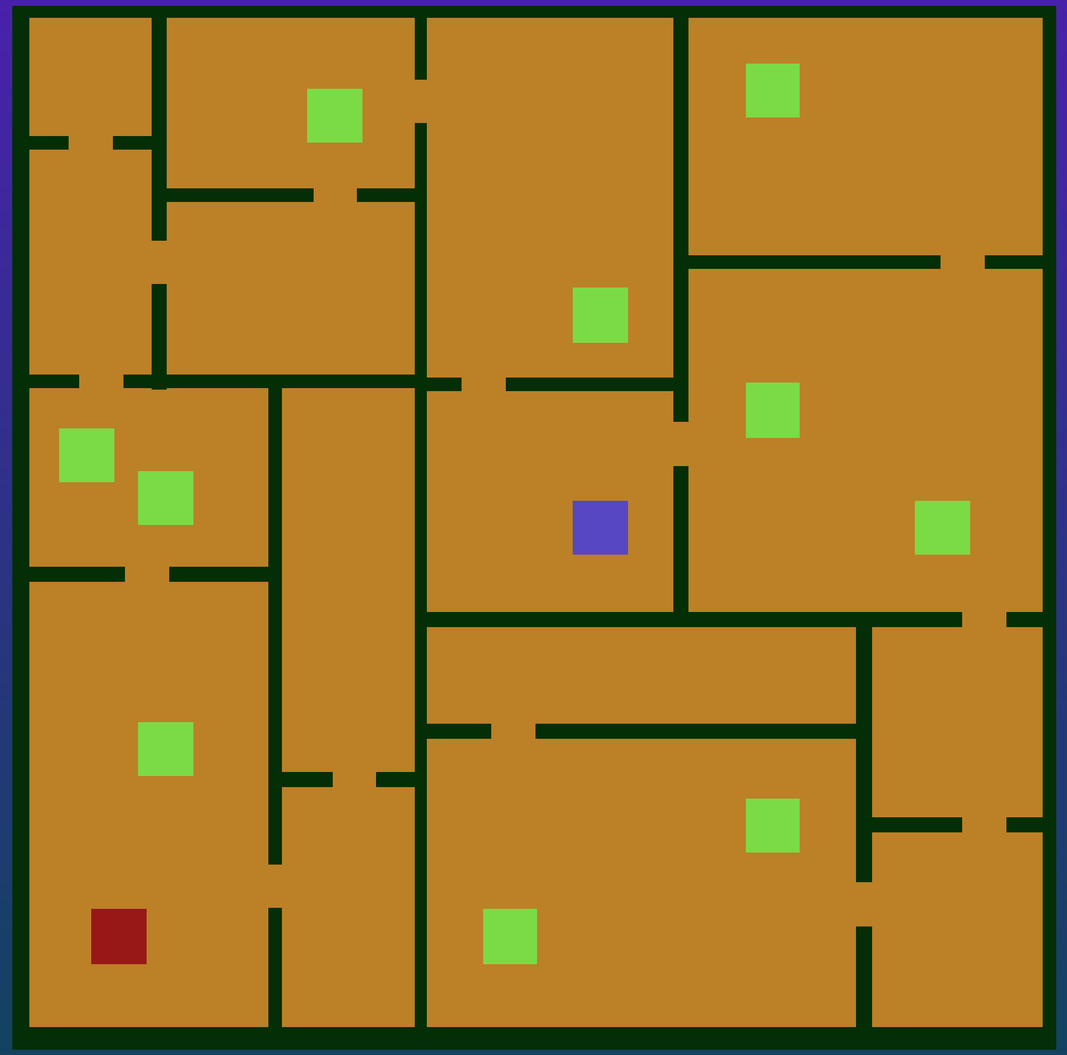
And again…



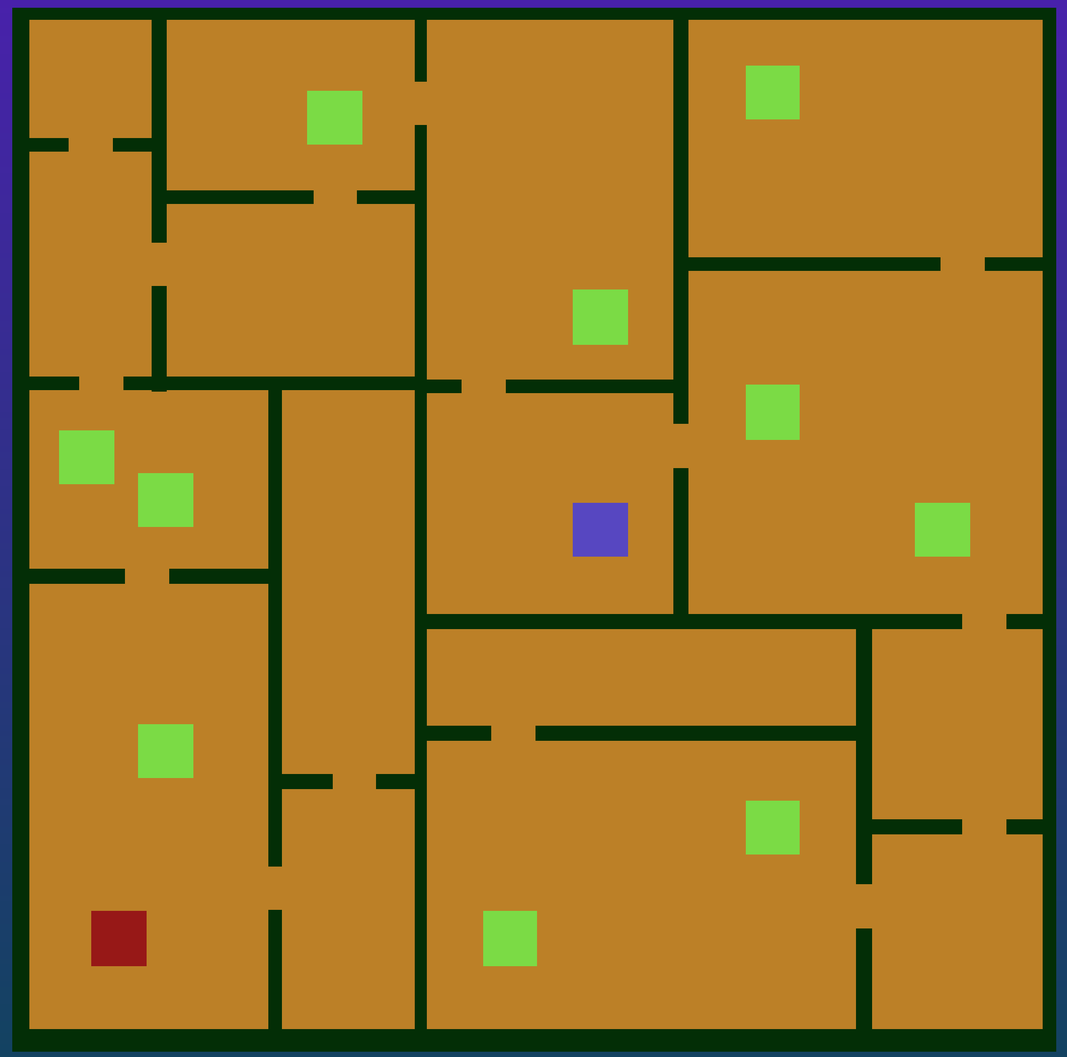
And again…



Place start and exit in a random tile.



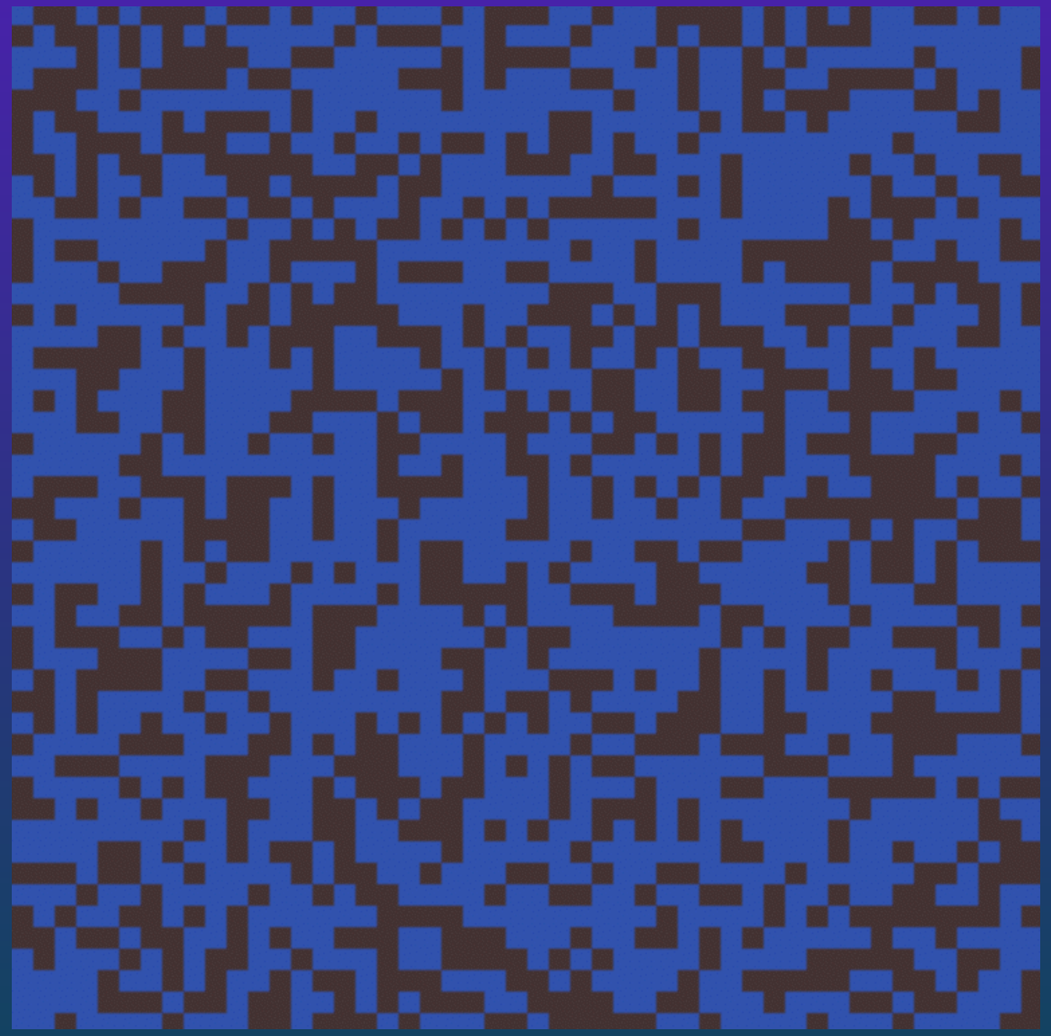
Place enemies and other entities on random tiles.



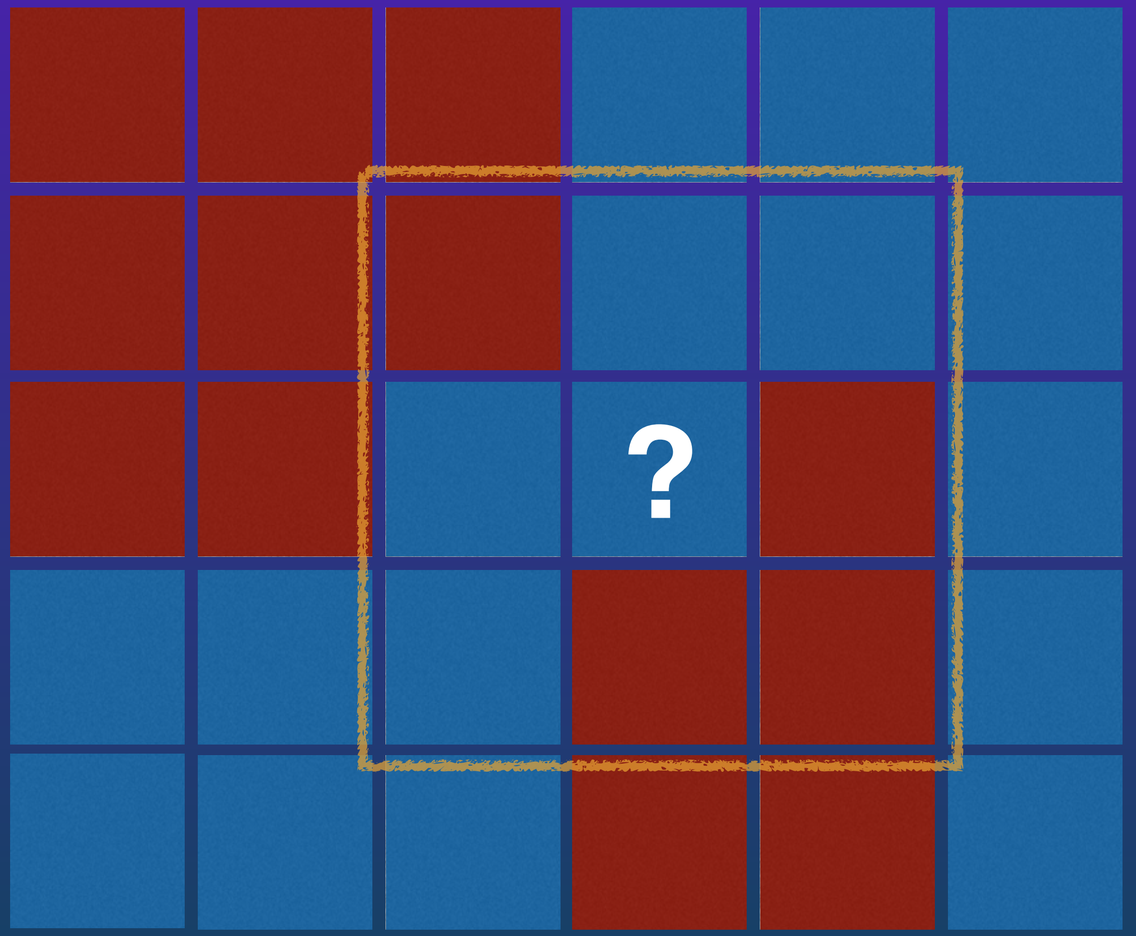
Procedural generation!

2D Caves using cellular automata.

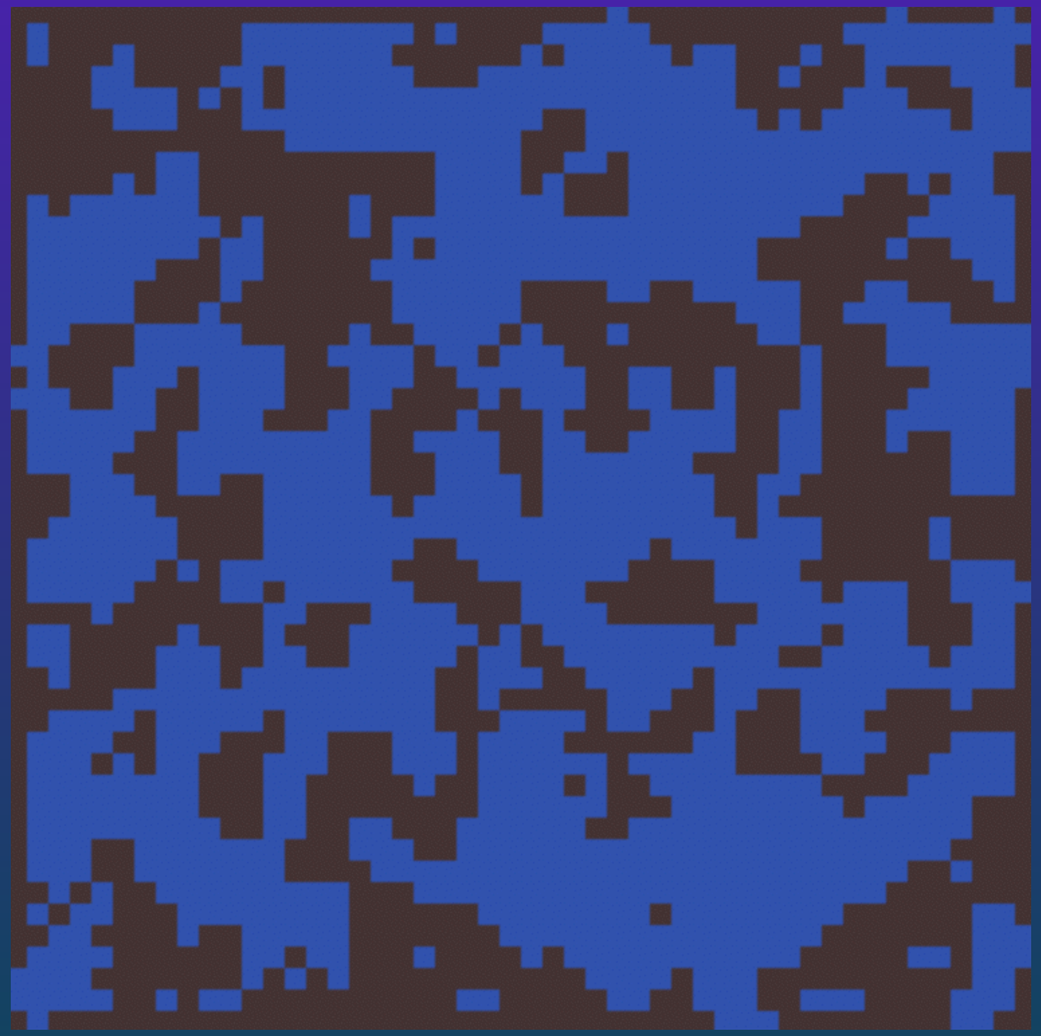
Cellular automata.



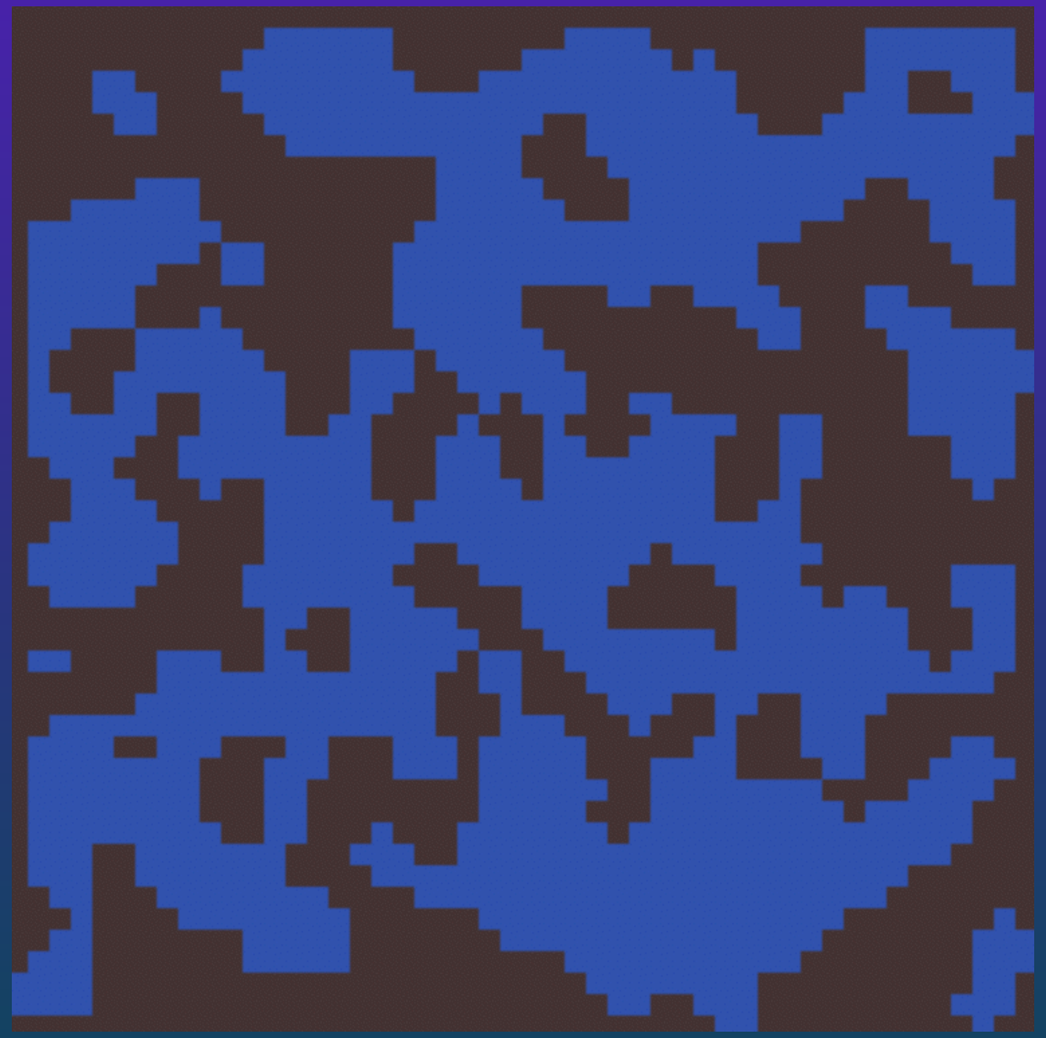
Fill tile map randomly.



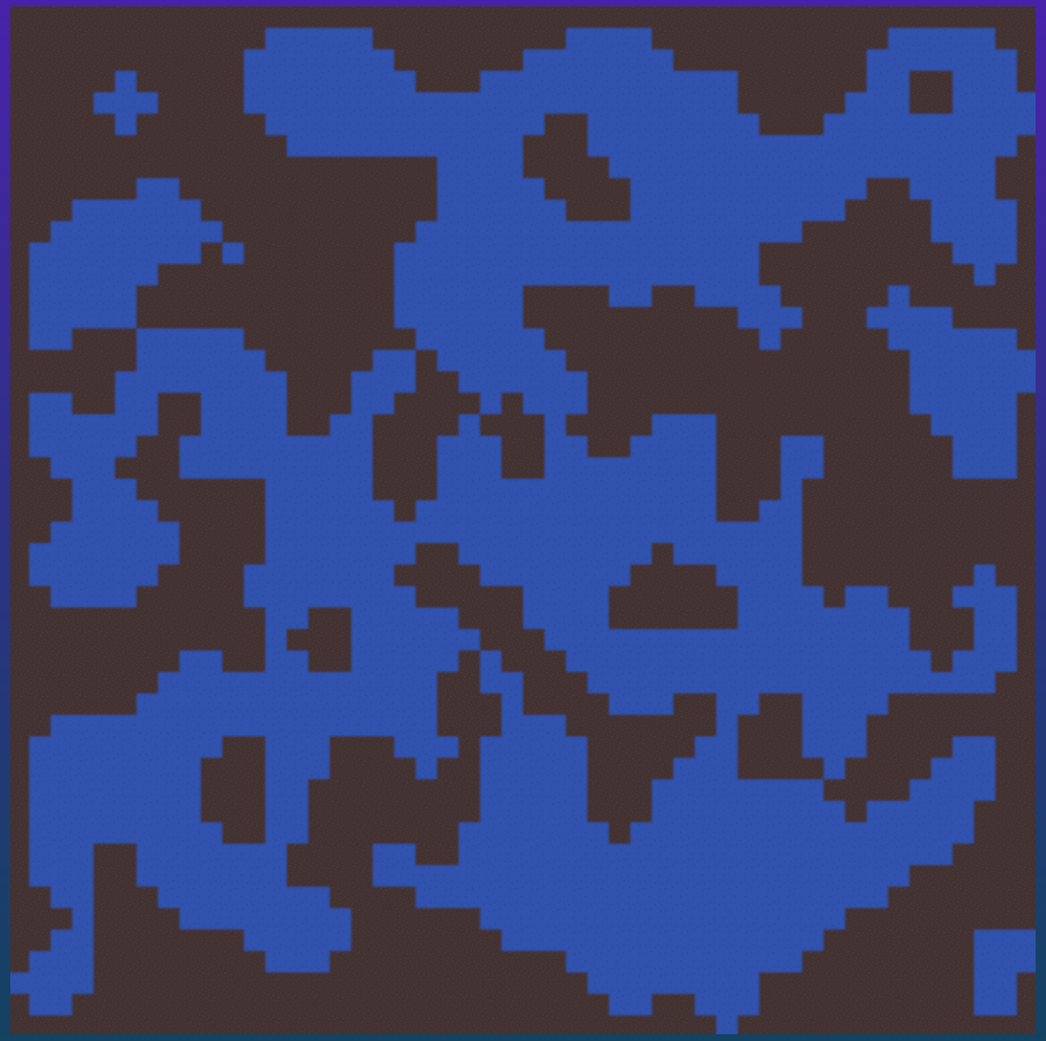
For every tile, count all of its neighbors, and if larger or lower than a certain threshold, create a new tile or kill the existing one.



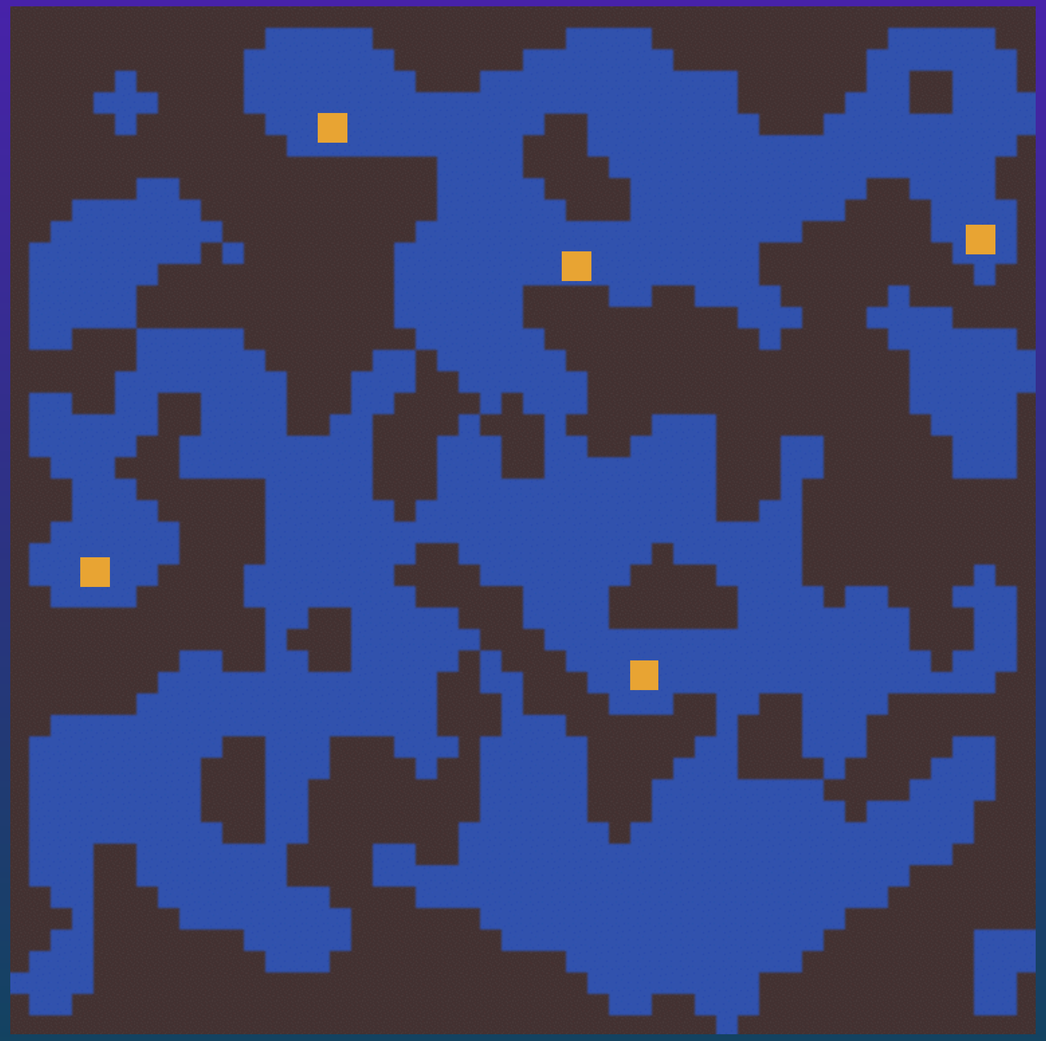
Do this for the entire tile map



Repeat again.



And again.



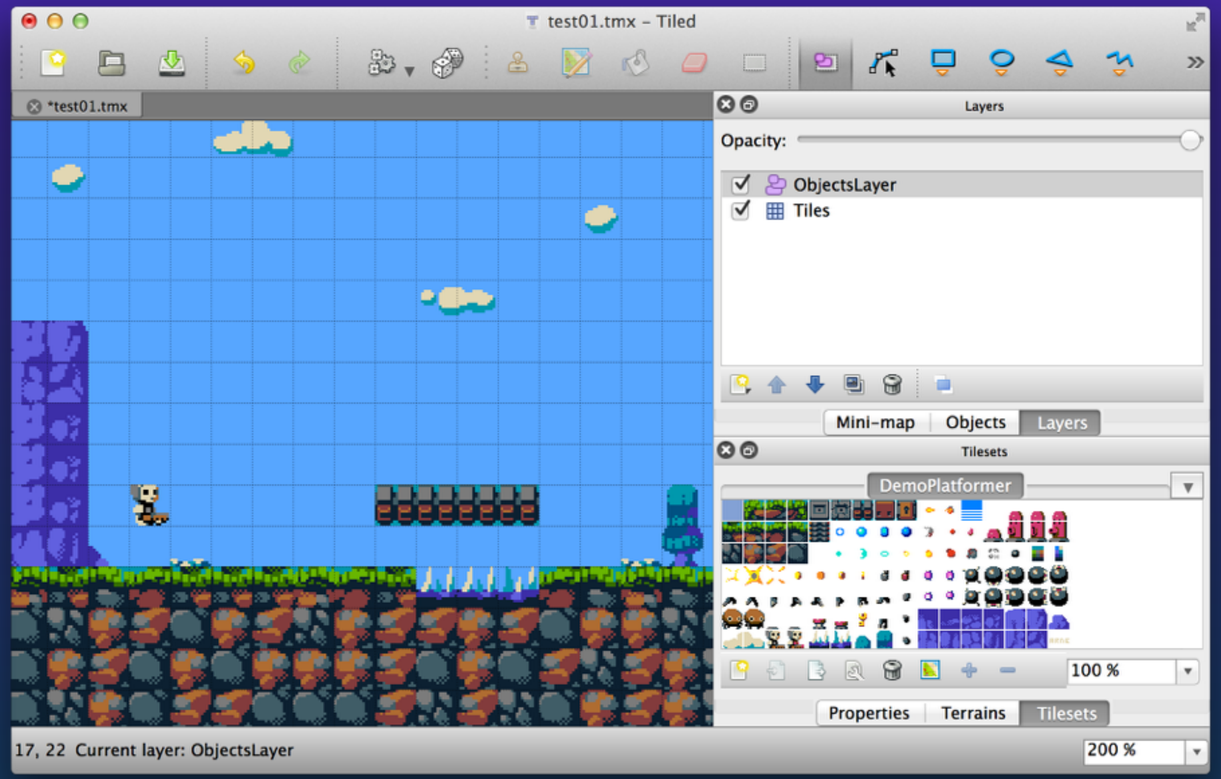
Place entities.

Generate Random Cave Levels Using Cellular Automata

http://gamedevelopment.tutsplus.com/tutorials/generate-random-cave-levels-using-cellular-automata--gamedev-9664

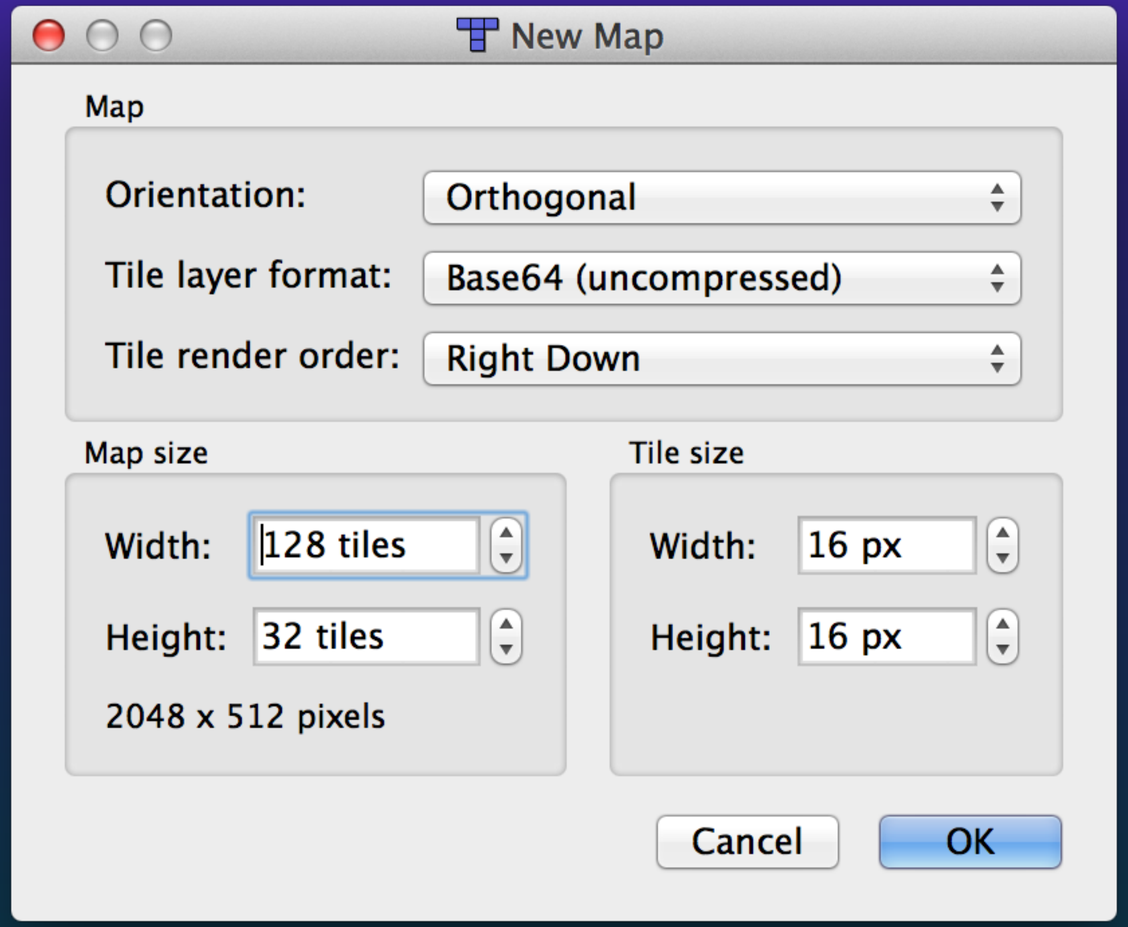
Using a map editor.

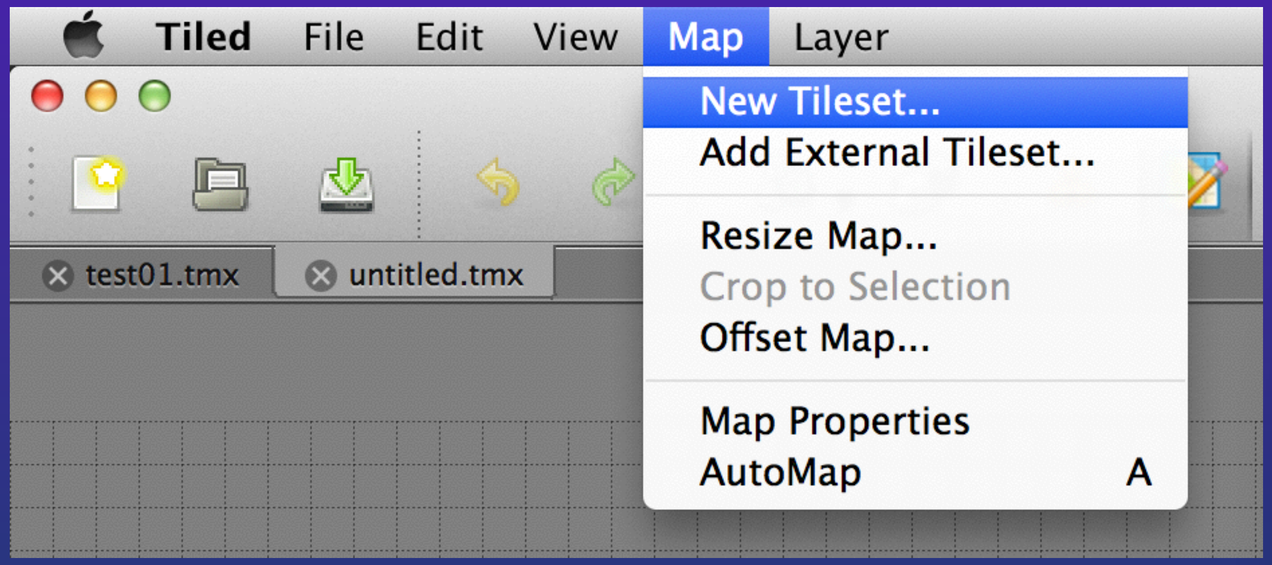
Tiled

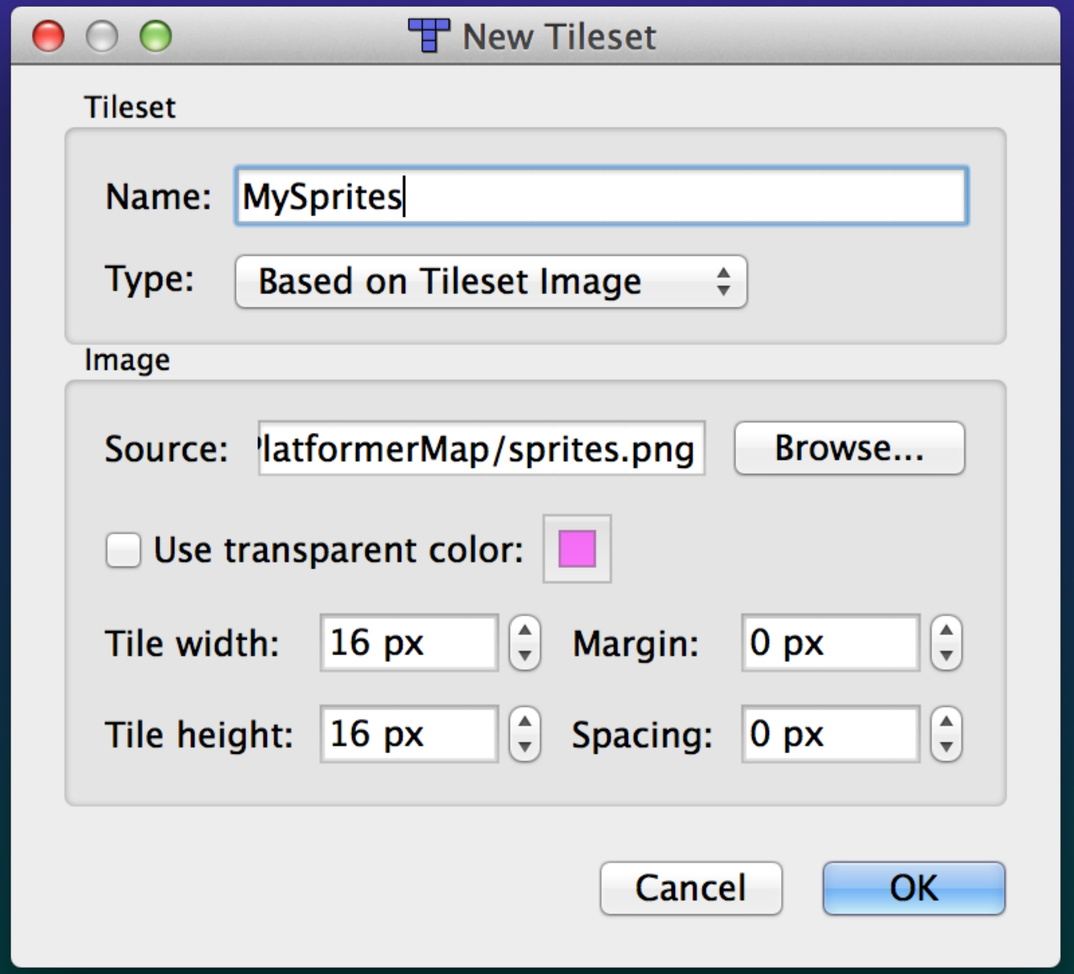


http://www.mapeditor.org/

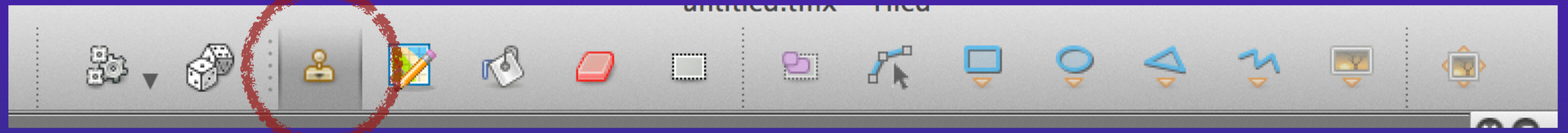
Building a level with Tiled.

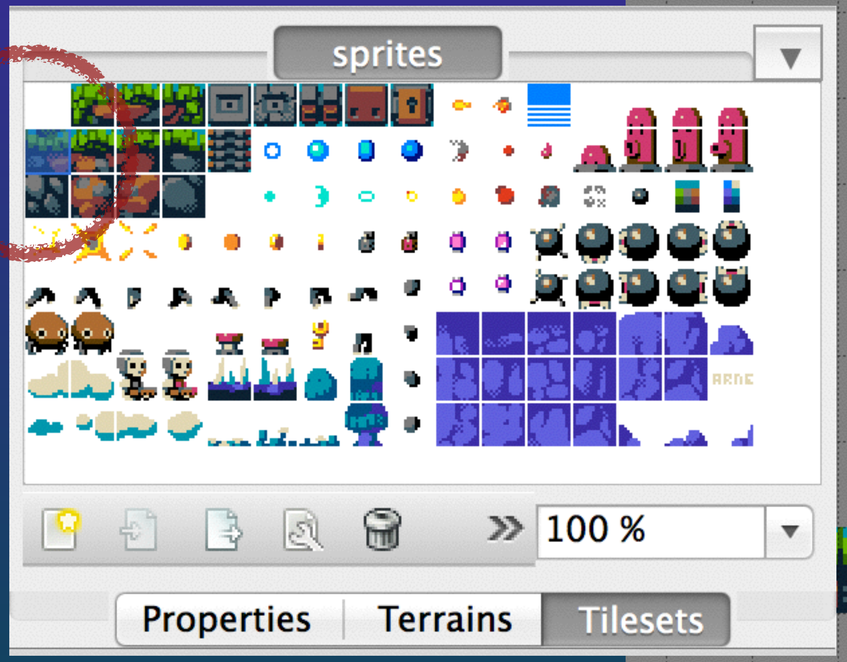

New Map
Map
Orientation:
Orthogonal
Tile layer format:
Base64 (uncompressed)
Tile render order:
Right Down
Map size
Width:
128 tiles
Height:
32 tiles
2048 x 512 pixels
Tile size
Width:
16 px
Height:
16 px
Cancel
OK

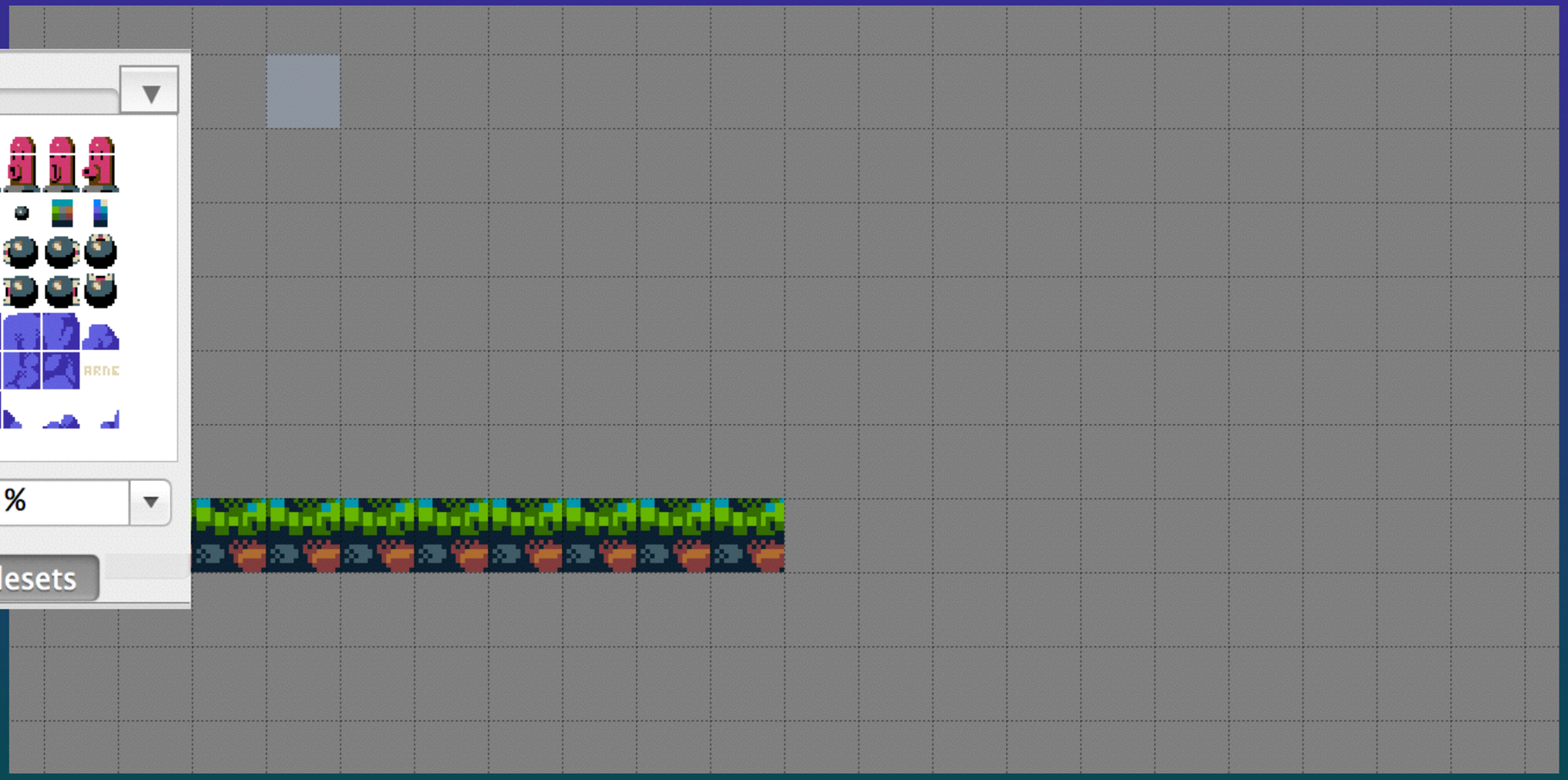

Tiled
File
Edit
View
Map
Layer
New Tileset...
Add External Tileset...
Resize Map...
Crop to Selection
Offset Map...
Map Properties
AutoMap
A
test01.tmx
untitled.tmx


New Tileset
Tileset
Name:
MySprites
Type:
Based on Tileset Image
Image
Source:
latformerMap/sprites.png
Browse...
Use transparent color:
Tile width:
16 px
Margin:
0 px
Tile height:
16 px
Spacing:
0 px
Cancel
OK

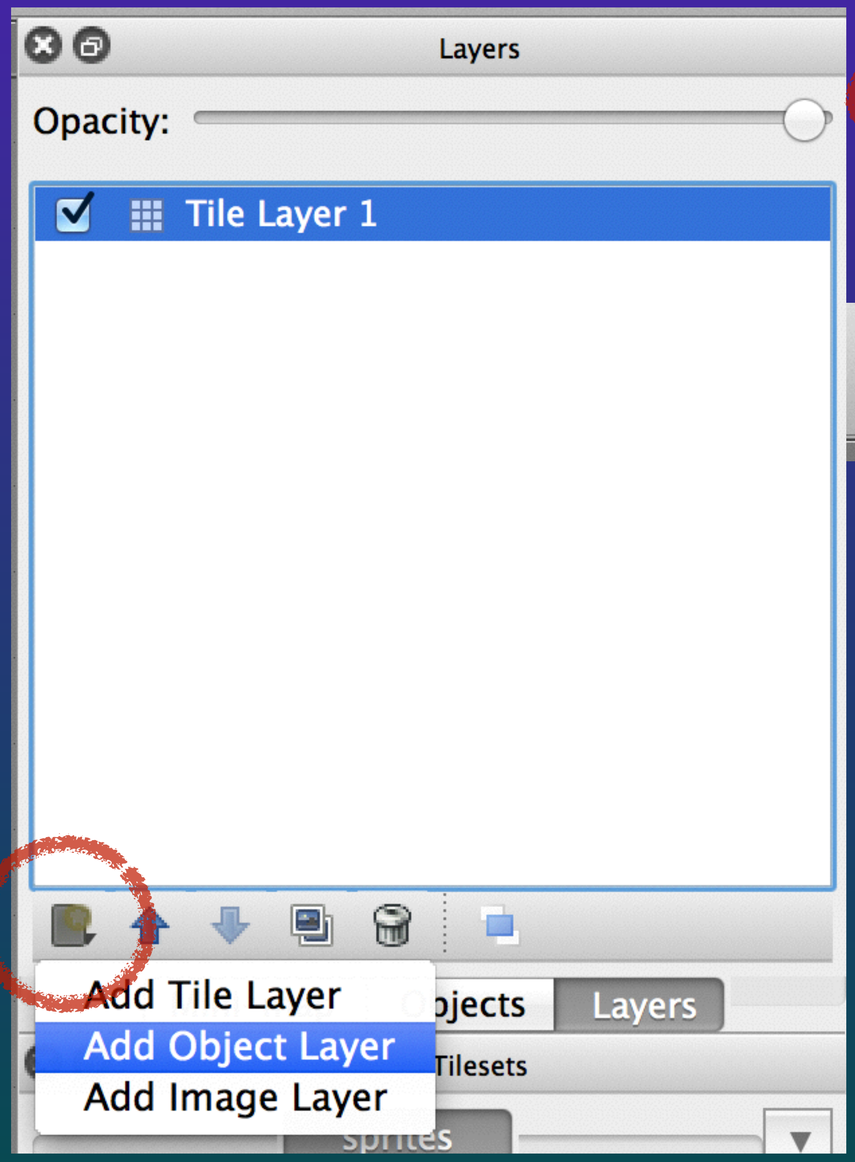
Drawing tiles

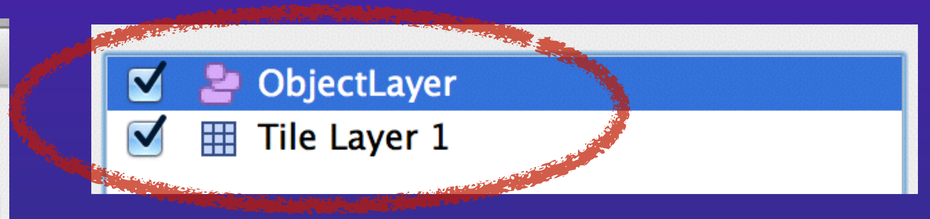



sprites
100 %
Properties
Terrains
Tilesets

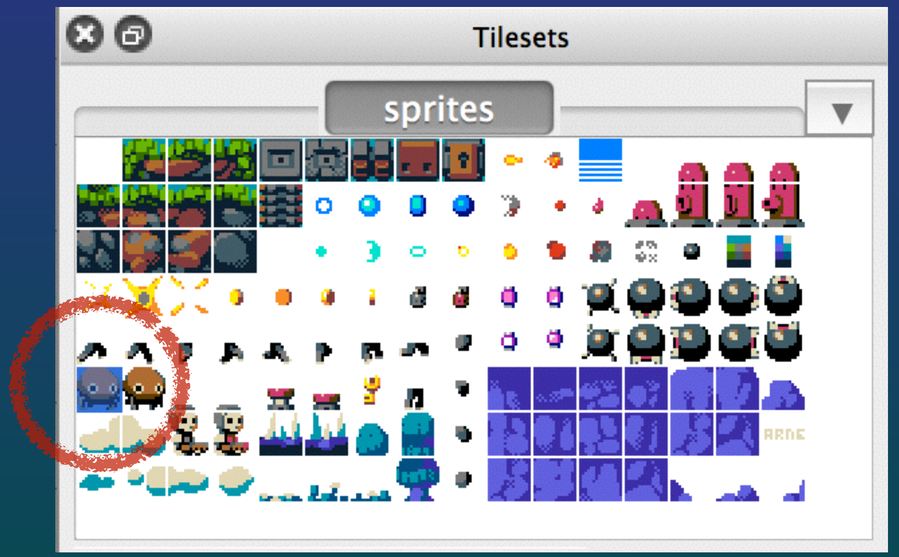


Placing entities.


Layers
Opacity:
Tile Layer 1
Add Tile Layer
Add Object Layer
Add Image Layer
Layers
Tilesets

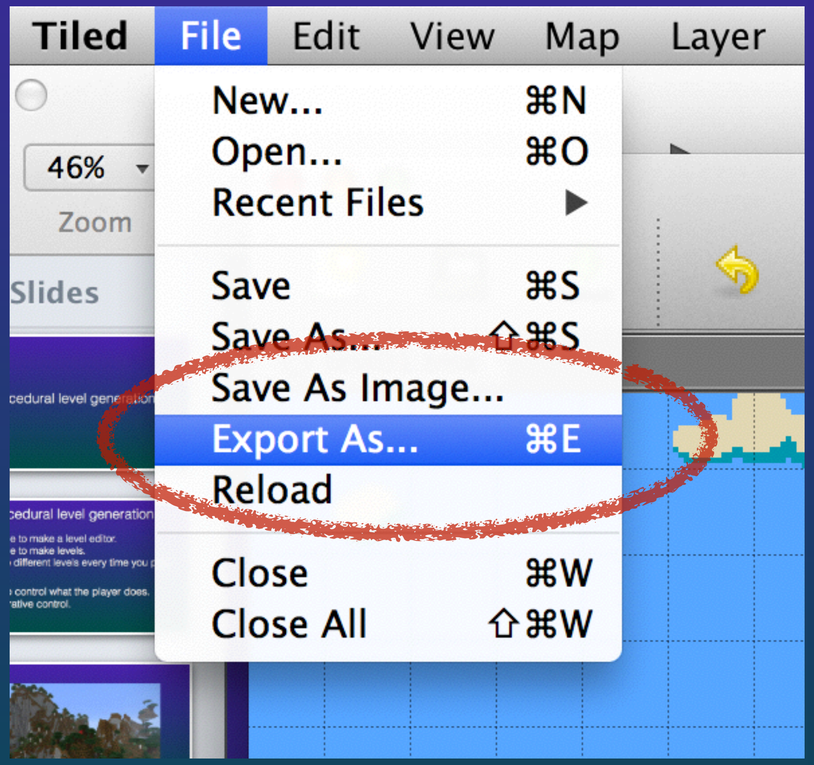

ObjectLayer
Tile Layer 1

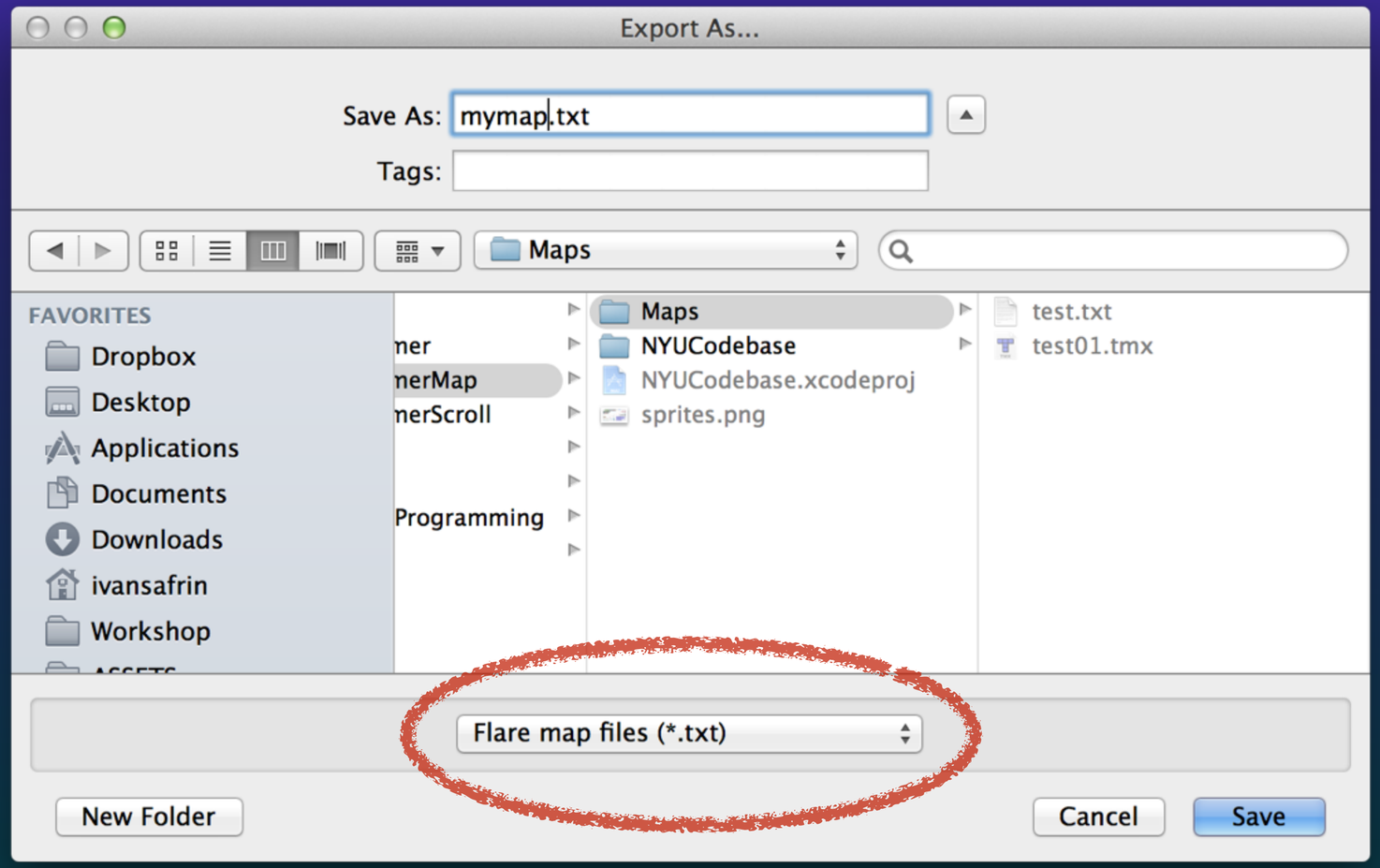

Insert Tile (T)


Tilesets
sprites

Loading Tiled levels in your game.

Export as Flare map file.





This is what it looks like

```
[header]
width=128
height=32
tilewidth=16
tileheight=16

[layer]
type=Tiles
data=
17,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

[ObjectsLayer]
# Start
type=Start
location=112.5,416,0,0

[ObjectsLayer]
# Enemy1
type=Enemy
location=423.5,401,0,0
```

Parsing text from a file.

What we'll need…

```
#include <fstream>
#include <string>
#include <iostream>
#include <sstream>

using namespace std;
```

Reading a file line by line…

```
ifstream infile("file.txt");
string line;
while (getline(infile, line)) {
    // handle line
}
```

```
ifstream infile(levelFile);
string line;
while (getline(infile, line)) {

        if(line == “[header]”) {
            if(!readHeader(infile)) {
                return;
            }
        } else if(line == "[layer]") {
            readLayerData(infile);
        } else if(line == "[ObjectsLayer]") {
            readEntityData(infile);
        }

}
```

```
[header]
width=128
height=32
tilewidth=16
tileheight=16

[layer]
type=Tiles
data=
17,0,0,0,0,0,0

[ObjectsLayer]
# Start
type=Start
location=112.5,416,0,0

[ObjectsLayer]
# Enemy1
type=Enemy
location=423.5,401,0,0
```

Keep in mind that “ObjectsLayer” is the name of our object layer in the editor, so you should check for whatever you named your object layer.

Reading the header.

Reading the key=value pairs.

```
istringstream sStream(line);
string key,value;
getline(sStream, key, '=');
getline(sStream, value);
```

Converting string to integer.

```
int intValue = atoi(value.c_str());
```

```
bool readHeader(std::ifstream &stream) {
    string line;
    mapWidth = -1;
    mapHeight = -1;
    while(getline(stream, line)) {
        if(line == "") { break; }

        istringstream sStream(line);
        string key,value;
        getline(sStream, key, '=');
        getline(sStream, value);

        if(key == "width") {
            mapWidth = atoi(value.c_str());
        } else if(key == "height"){
            mapHeight = atoi(value.c_str());
        }
    }

    if(mapWidth == -1 || mapHeight == -1) {
        return false;
    } else { // allocate our map data
        levelData = new unsigned char*[mapHeight];
        for(int i = 0; i < mapHeight; ++i) {
            levelData[i] = new unsigned char[mapWidth];
        }
        return true;
    }
}
```

```
[header]
width=128
height=32
tilewidth=16
tileheight=16

[layer]
type=Tiles
data=
17,0,0,0,0,0,0

[ObjectsLayer]
# Start
type=Start
location=112.5,416,0,0

[ObjectsLayer]
# Enemy1
type=Enemy
location=423.5,401,0,0
```

Reading the tile data.

```
bool readLayerData(std::ifstream &stream) {
    string line;
    while(getline(stream, line)) {
        if(line == "") { break; }
        istringstream sStream(line);
        string key,value;
        getline(sStream, key, '=');
        getline(sStream, value);
        if(key == "data") {
            for(int y=0; y < mapHeight; y++) {
                getline(stream, line);
                istringstream lineStream(line);
                string tile;

                for(int x=0; x < mapWidth; x++) {
                    getline(lineStream, tile, ',');
                    unsigned char val =  (unsigned char)atoi(tile.c_str());
                    if(val > 0) {
// be careful, the tiles in this format are indexed from 1 not 0
                        levelData[y][x] = val-1;
                    } else {
                        levelData[y][x] = 0;
                    }
                }

            }
        }
    }
    return true;
}
```

```
[header]
width=128
height=32
tilewidth=16
tileheight=16

[layer]
type=Tiles
data=
17,0,0,0,0,0,0
0,0,0,0,0,0,0

[ObjectsLayer]
# Start
type=Start
location=112.5,416,0,0

[ObjectsLayer]
# Enemy1
type=Enemy
location=423.5,401,0,0
```

Reading the entity data.

```
bool readEntityData(std::ifstream &stream) {

    string line;
    string type;

    while(getline(stream, line)) {
        if(line == "") { break; }

        istringstream sStream(line);
        string key,value;
        getline(sStream, key, '=');
        getline(sStream, value);

        if(key == "type") {
            type = value;
        } else if(key == "location") {

            istringstream lineStream(value);
            string xPosition, yPosition;
            getline(lineStream, xPosition, ',');
            getline(lineStream, yPosition, ',');

            float placeX = atoi(xPosition.c_str())/16*TILE_SIZE;
            float placeY = atoi(yPosition.c_str())/16*-TILE_SIZE;

            placeEntity(type, placeX, placeY);
        }
    }
    return true;
}
```

```
[header]
width=128
height=32
tilewidth=16
tileheight=16

[layer]
type=Tiles
data=
17,0,0,0,0,0,0
0,0,0,0,0,0

[ObjectsLayer]
# Start
type=Start
location=112.5,416,0,0

[ObjectsLayer]
# Enemy1
type=Enemy
location=423.5,401,0,0
```

Assignment.

- Make a simple scrolling sidescroller or topdown game demo.
- It must use a tilemap.
- It must scroll.
- It must be either procedurally generated or load levels from a file.
- You have two weeks (due Monday after next).