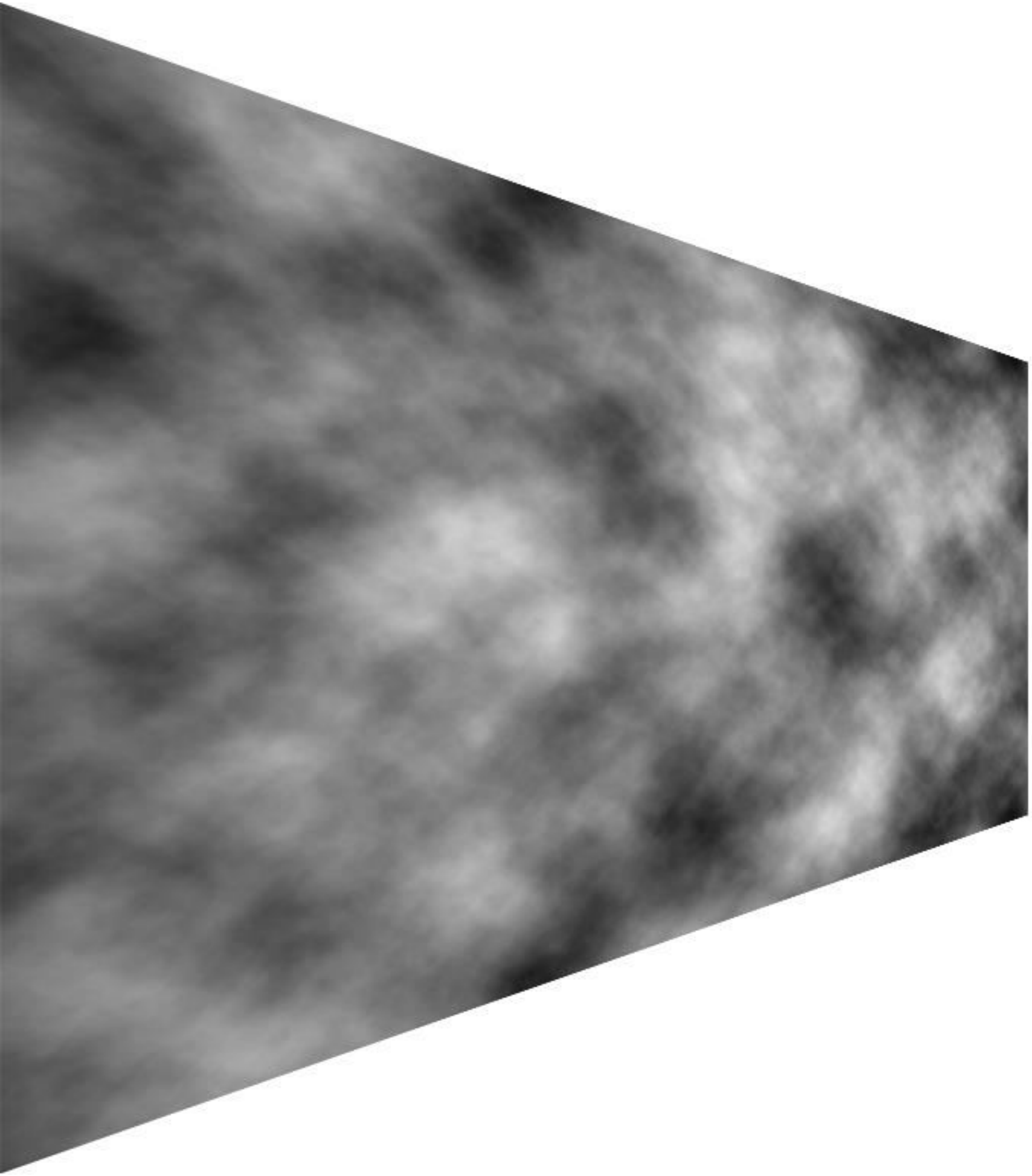
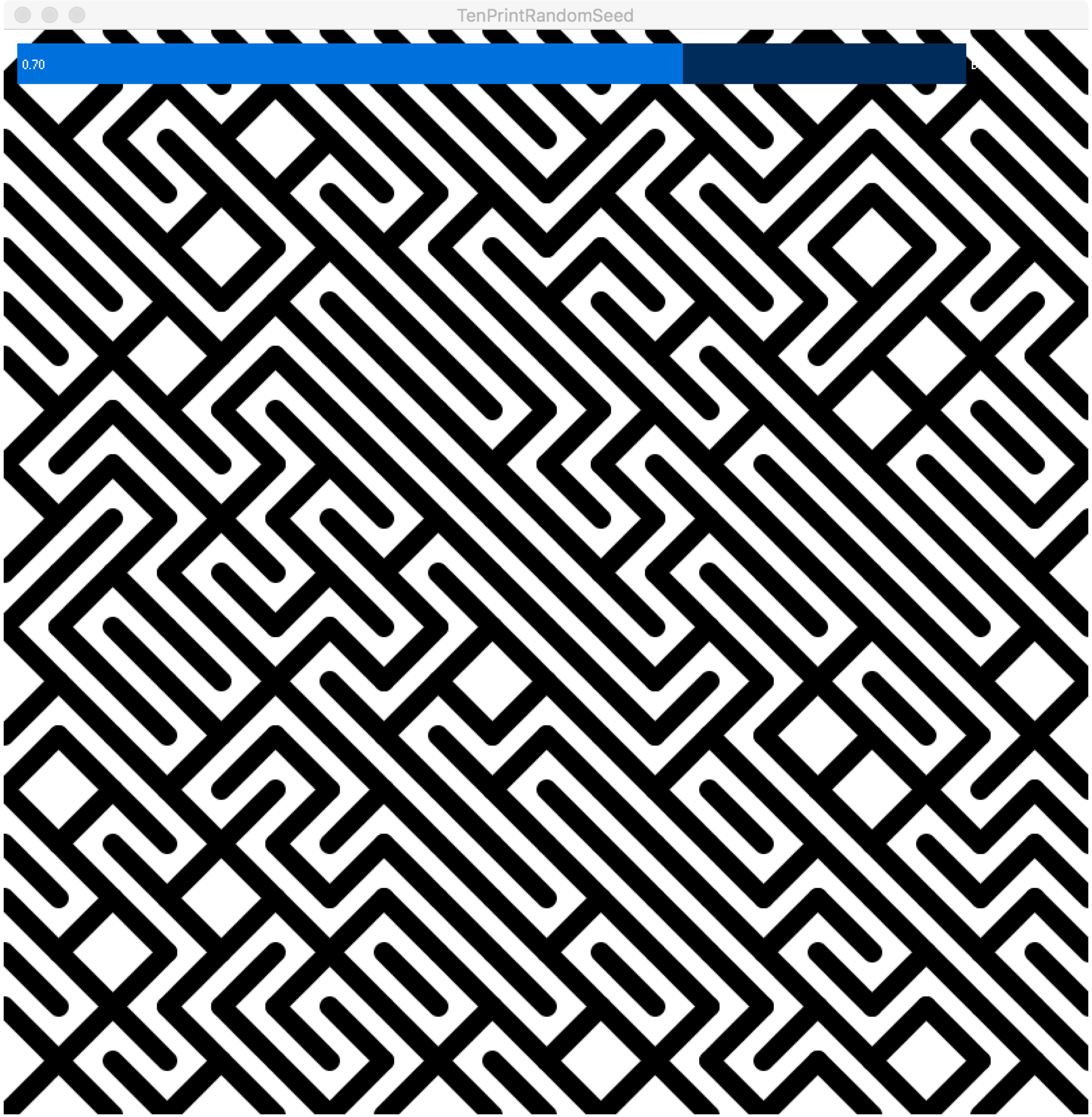


Module 09

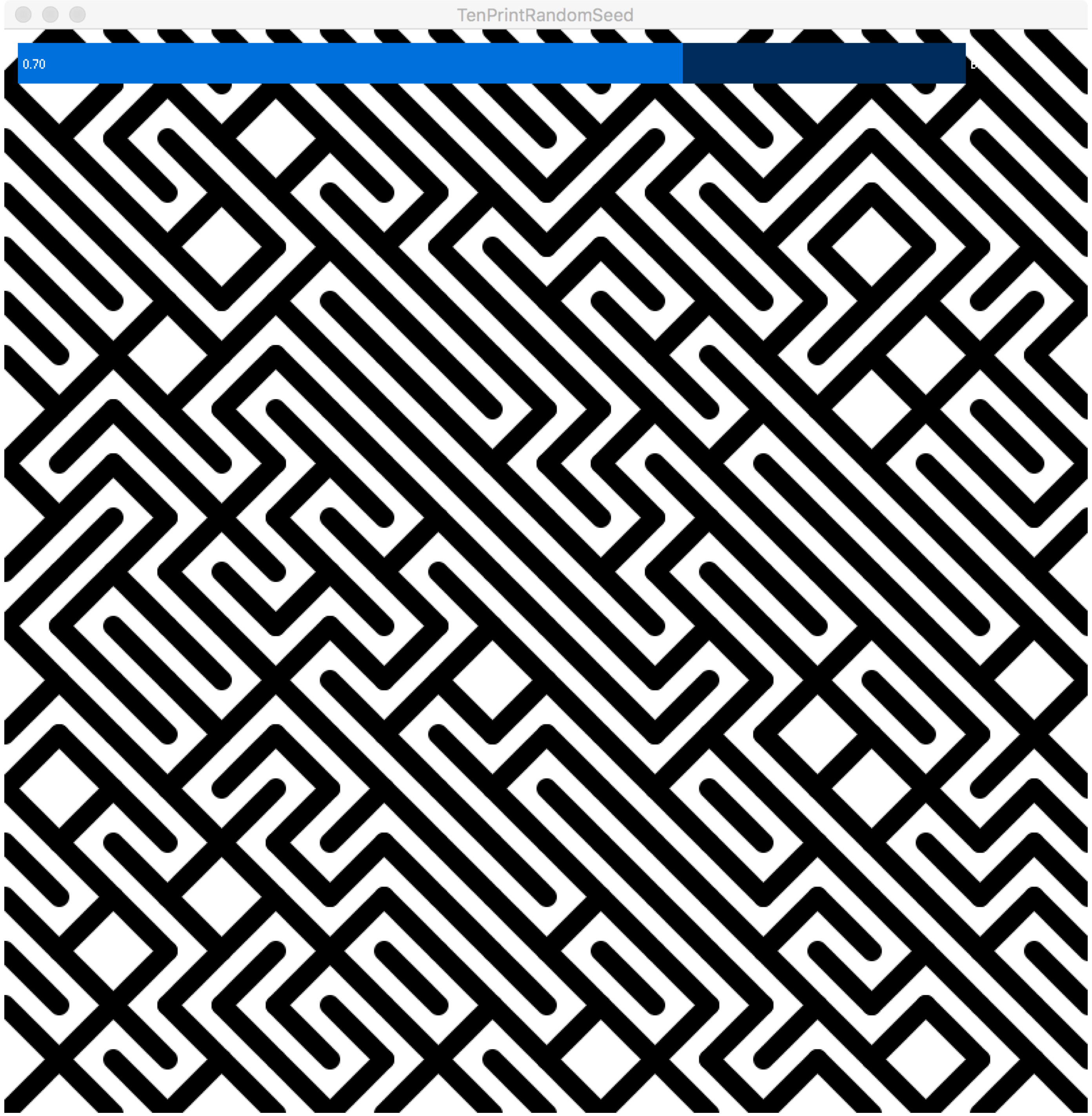
Noise

CS 106 Winter 2018

Last week…



What’s
out
here?



what
about
here?

and here?

Let’s add Direct Manipulation to the 10 Print sketch:

- In draw(), use translate() inside a geometric context.
- User a mouseDragged() hook to control the amount of translation (by setting global variables).

But there’s no more pattern to see!

Workaround: just draw more of the pattern.

```
for ( int row = 0; row < 20; ++row ) {
  for ( int col = 0; col < 20; ++col ) {
    float x = col * 40;
    float y = row * 40;

    if ( random(1) < bias ) {
      // Draw a line from NW to SE
      line( x, y, x + 40, y + 40 );
    } else {
      // Draw a line from NE to SW
      line( x + 40, y, x, y + 40 );
    }
  }
}
```

Workaround: just draw more of the pattern.

```
for ( int row = -20; row < 40; ++row ) {
  for ( int col = -20; col < 40; ++col ) {
    float x = col * 40;
    float y = row * 40;

    if ( random(1) < bias ) {
      // Draw a line from NW to SE
      line( x, y, x + 40, y + 40 );
    } else {
      // Draw a line from NE to SW
      line( x + 40, y, x, y + 40 );
    }
  }
}
```

But this is inefficient, inelegant, and limited.

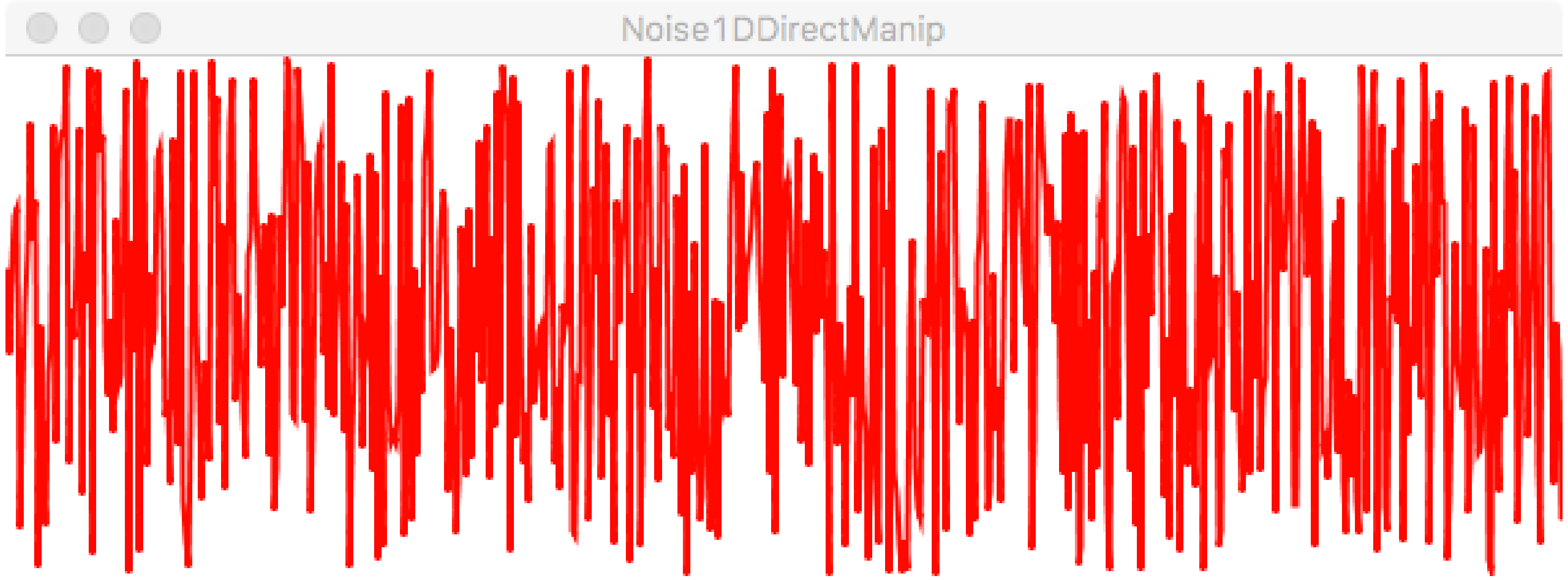
What we really want is a *permanent* way to associate pseudorandom values with points in space.

Let’s examine a simpler 1D problem.

Drawing a graph of random values

```
beginShape();
for( int x = 0; x < 600; ++x ) {
  vertex( x, random( 0, height ) );
}
endShape();
```

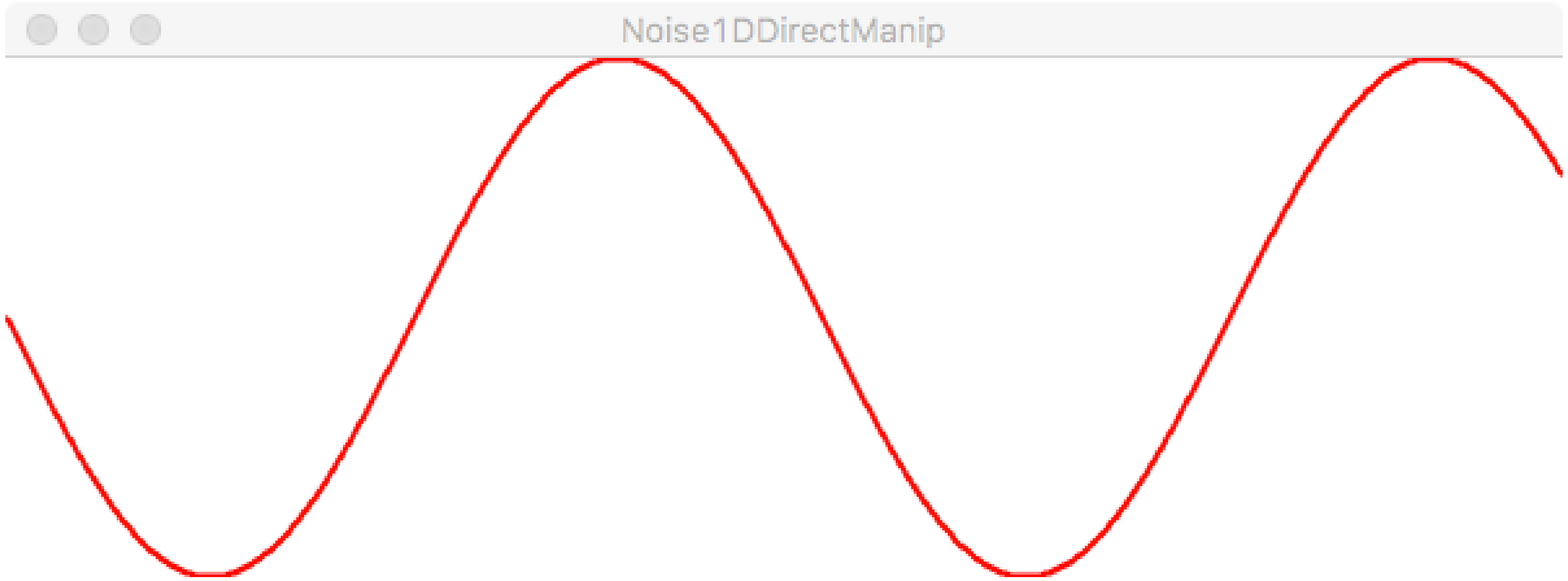
What's out here?

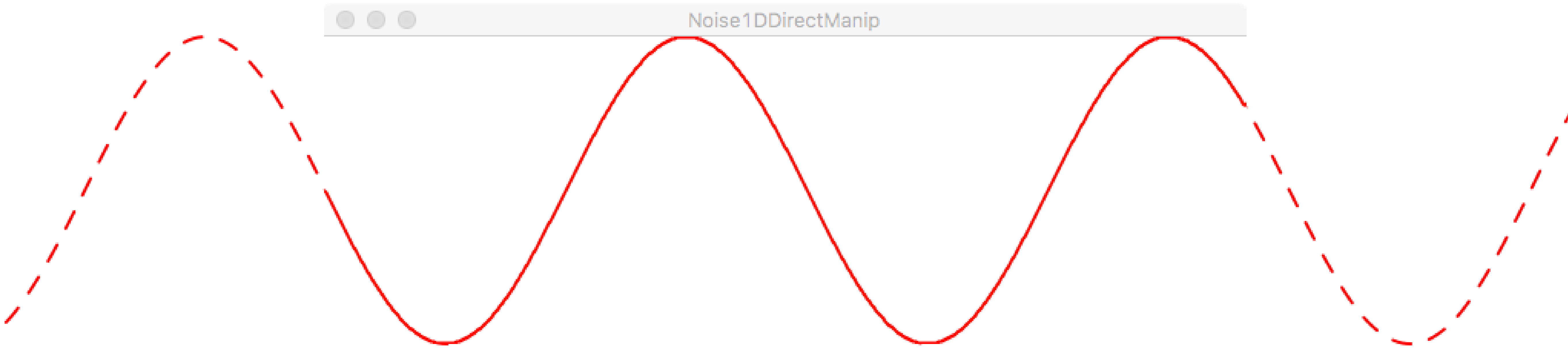


what about here?

Graphing a mathematical function

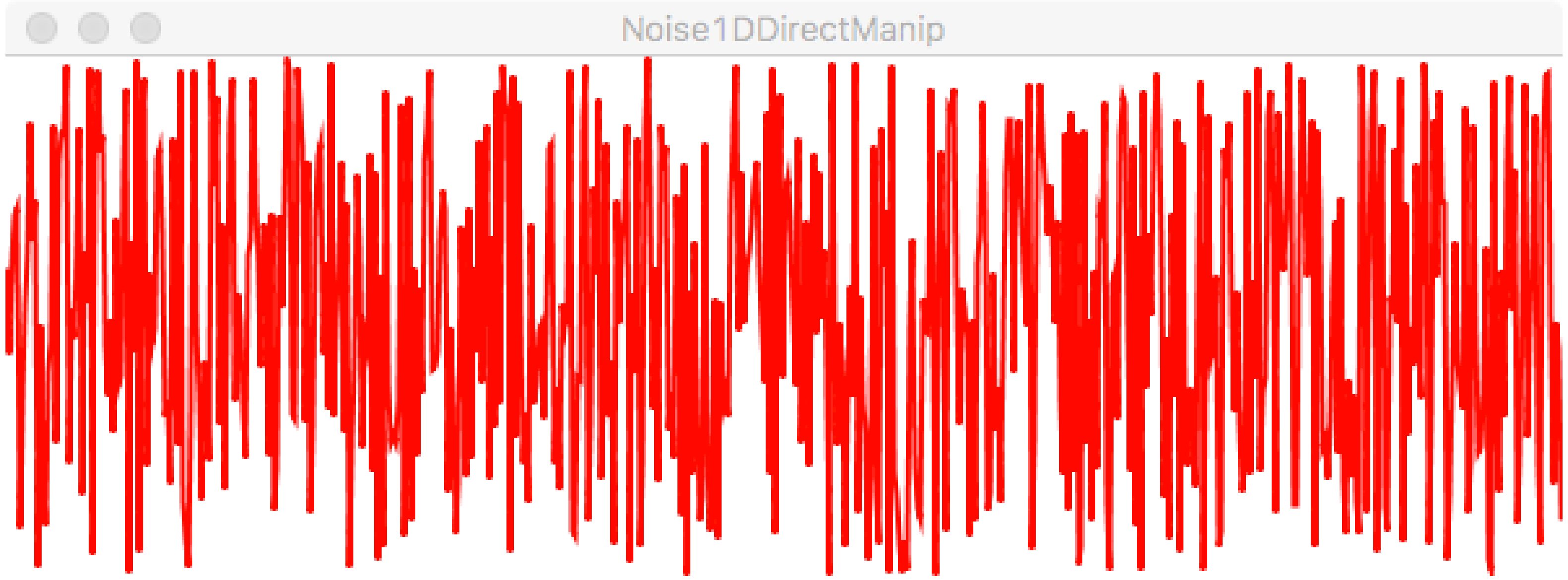
```
float myFunc( float x )
{
  float y = sin( x / 50.0 );
  return map( y, -1, 1, 0, height );
}

…
beginShape();
for( int x = 0; x < 600; ++x ) {
  vertex( x, myFunc( x ) );
}
endShape();
```


Noise1DDirectManip

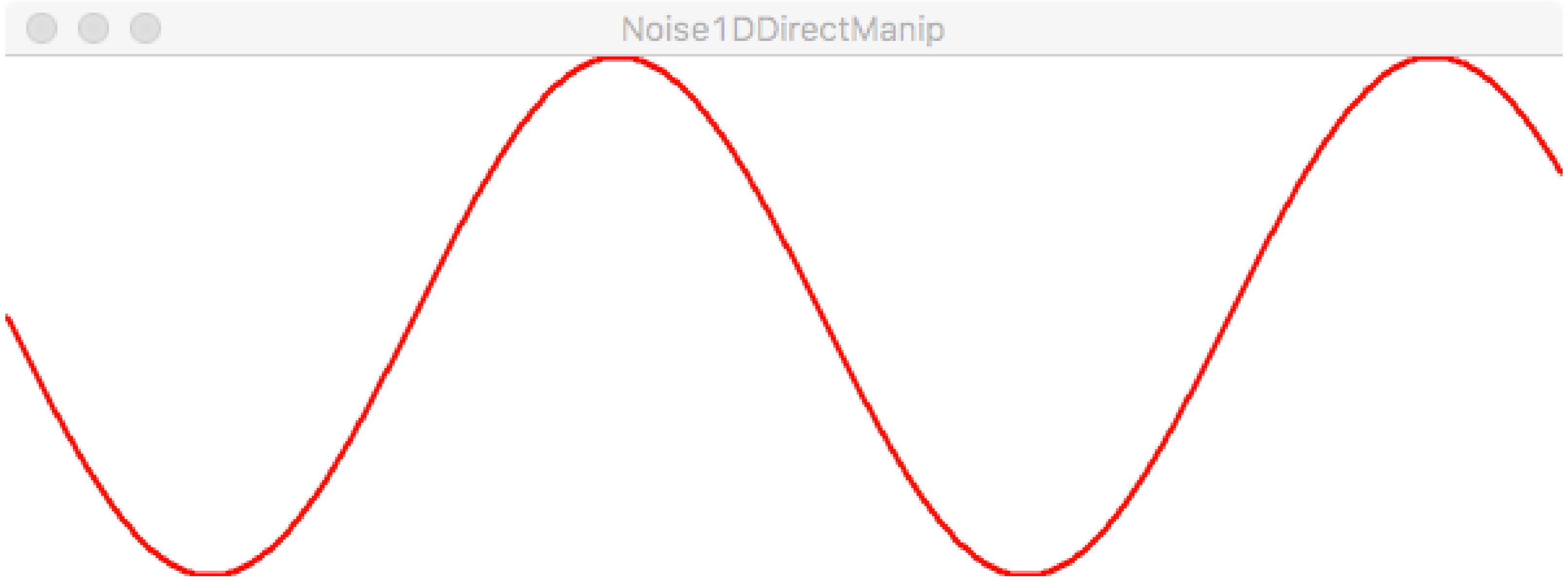

Noise1DDirectManip

```
float dx;

…
beginShape();
for( int x = 0; x < 600; ++x ) {
  vertex( x + dx, myFunc( x ) );
}
endShape();
```

```
float dx;

…
beginShape();
for( int x = 0; x < 600; ++x ) {
  vertex( x, myFunc( x - dx ) );
}
endShape();
```



Unpredictable: can't guess what the graph will look like.



Repeatable: A given *x* will always give the same result.

Can we create a function that's repeatable **and** unpredictable?

```
float noise( float x ) { ... }
```

Return a “random” value between 0 and 1. The return value is always the same for a given input value x.

Note: noise() is a *smooth* function. If you zoom in enough, it changes slowly.

```
float noise( float x, float y ) { ... }
```

Return a “random” value between 0 and 1. The return value is always the same for given input values x and y.

```
float noise( float x, float y, float z ) { ... }
```

Visualizing 2D noise

```
void draw()
{
  for( int y = 0; y < height; ++y ) {
    for( int x = 0; x < width; ++x ) {
      float ns = 255 * noise( x, y );
      set( x, y, color( ns ) );
    }
  }
}
```

Direct manipulation of a grid

Direct manipulation of an infinite grid is challenging because we want to draw only as much of the grid as we need.

Goals

- Be able to write short sketches that use the noise() function.

- Understand how noise() works in 1D and 2D.

- Understand the difference between random() and noise().