

Drawing pictures ... It's not art, it's fun

# Basic Processing ...

*Lawrence Snyder*  
*University of Washington, Seattle*

# Review from Last Time ...

- Digital information can be processed by machines
- Since Hollerith digitized census data in 1890 we've come a long way: computers, transistors and integrated circuits, PCs, Internet, WWW, and ... each had a huge effect

# Processing ...

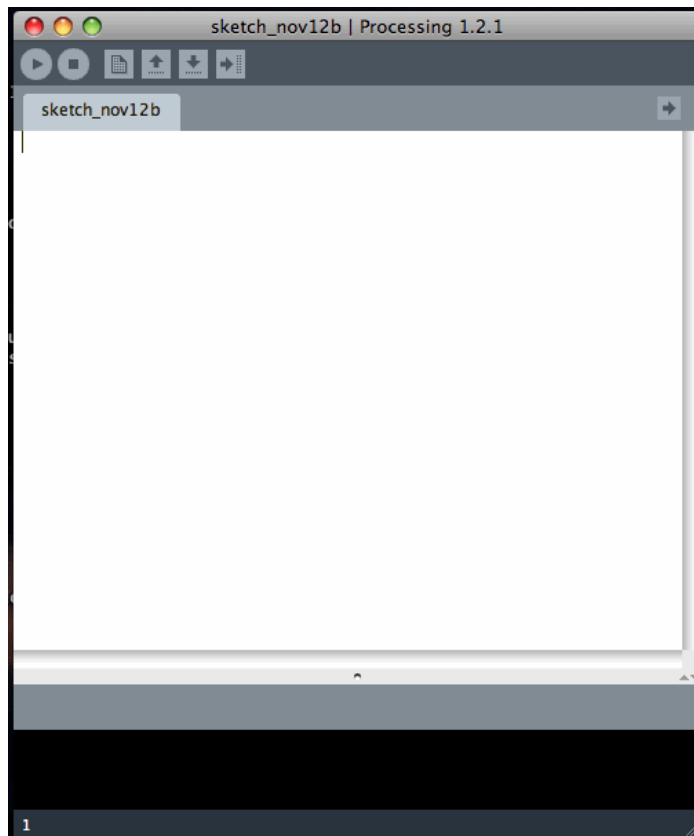
- It's our main programming language
- "Processing" is kind of a dumb name, but it is a good (and fun) language
- It's a language for programming graphical and image-based computations
  - More fun than programming an operating system
  - Easier to do because we "see" what's happening

# Short Interrupt: Grab Processing

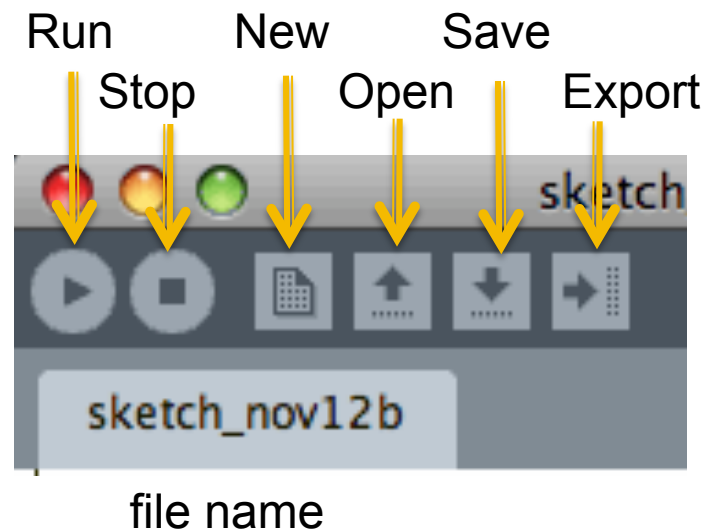
- If you have a personal computer that is convenient to do homework on, then grab a copy of the Processing system and put it on your machine ... improve your convenience!
- Grab it at: <http://processing.org/download/>
- You will want “Windows” or “Mac” versions
- Following installation instructions ... it takes less than 5 minutes and then you can work on your own computer!

# What You See

- When you start up the Processing system...

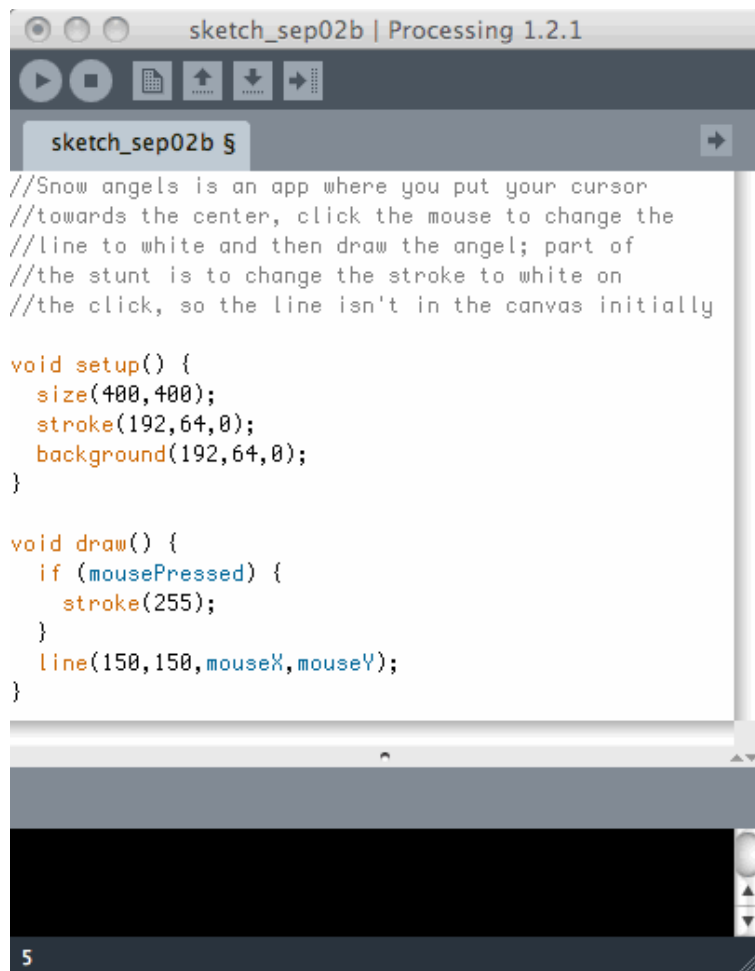


programming window



# Add Some Code

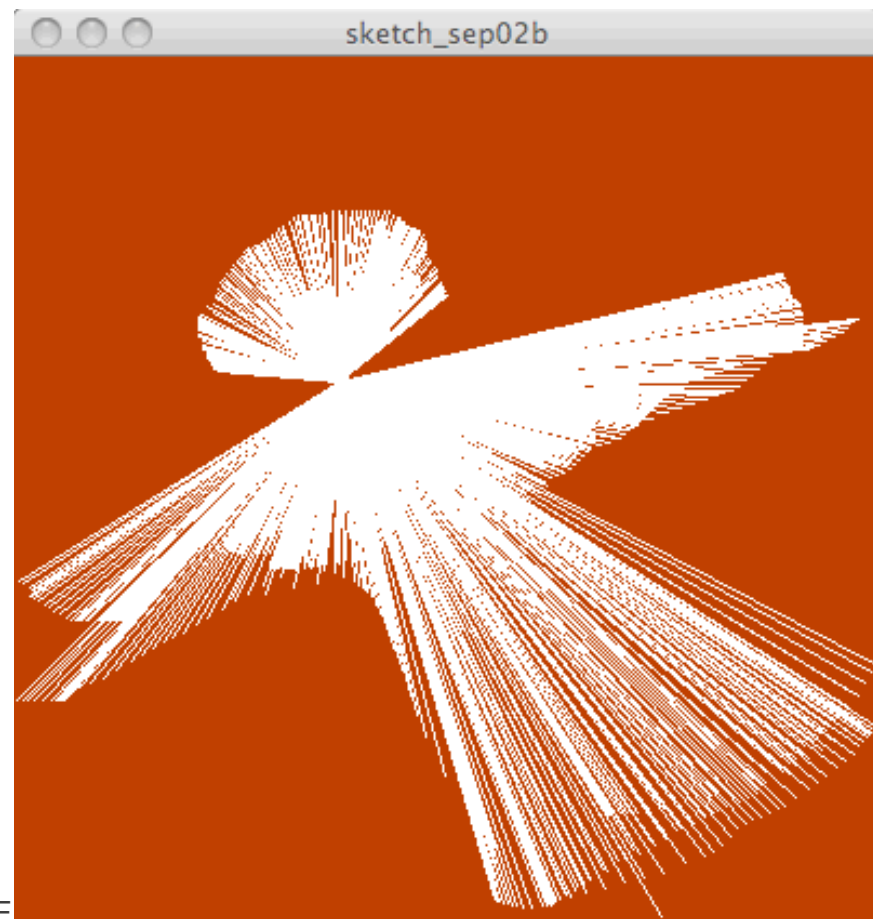
- Type in instructions that you will learn shortly  
Then run your program



```
sketch_sep02b | Processing 1.2.1
sketch_sep02b §
//Snow angels is an app where you put your cursor
//towards the center, click the mouse to change the
//line to white and then draw the angel; part of
//the stunt is to change the stroke to white on
//the click, so the line isn't in the canvas initially

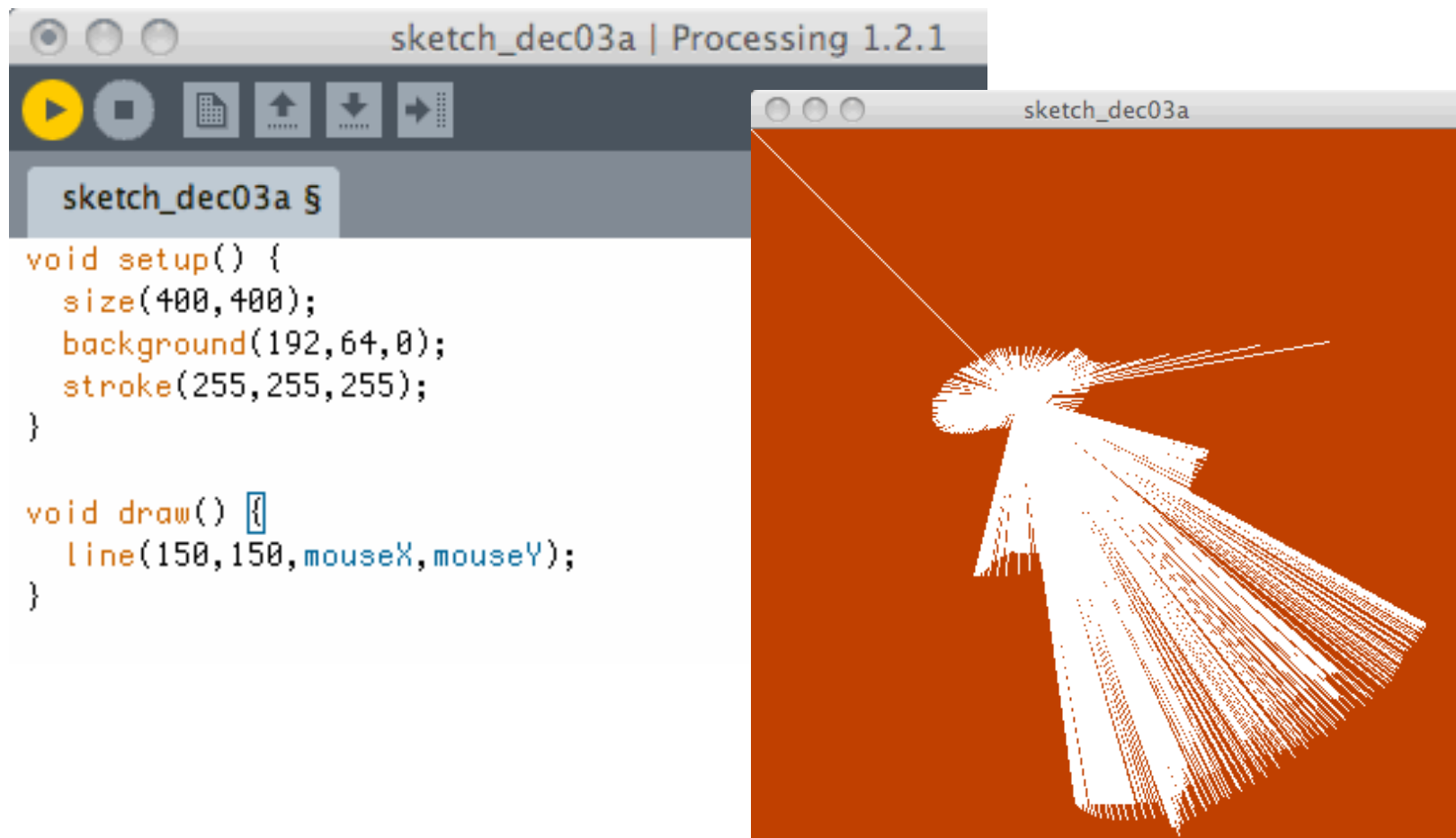
void setup() {
  size(400,400);
  stroke(192,64,0);
  background(192,64,0);
}

void draw() {
  if (mousePressed) {
    stroke(255);
  }
  line(150,150,mouseX,mouseY);
}
```



# Looking At Simpler Code

- Drawing a snow angel is straightforward ...



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The image shows a screenshot of the Processing IDE. The window title is "sketch\_dec03a | Processing 1.2.1". The code editor contains the following code:

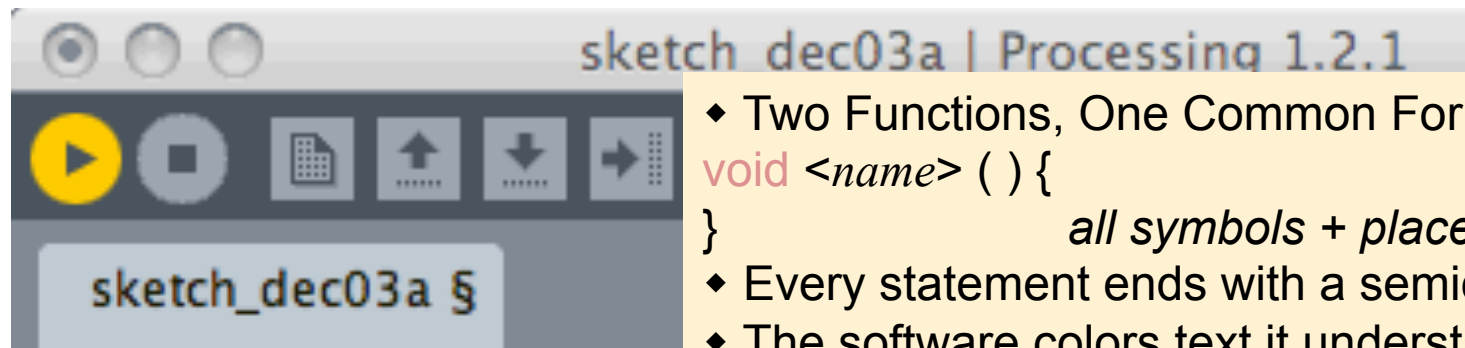
```
sketch_dec03a §  
void setup() {  
  size(400,400);  
  background(192,64,0);  
  stroke(255,255,255);  
}  
  
void draw() {  
  line(150,150,mouseX,mouseY);  
}
```

Below the code editor is a yellow button with the text "Just Do It!". To the right of the code editor is a preview window titled "sketch\_dec03a" showing a 400x400 orange canvas with a white snow angel drawn on it. The snow angel is composed of many white lines radiating from a central point (150, 150) to the mouse cursor, creating a fan-like shape.



# Coding Is ALL Detail

- Notice everything!



```
void setup() {  
  size(400, 400);  
  background(192, 64, 0);  
  stroke(255, 255, 255);  
}  
  
void draw() {  
  line(150, 150, mouseX, mouseY);  
}
```

- ◆ Two Functions, One Common Form:

```
void <name> ( ) {  
}
```

*all symbols + placement, matter*

- ◆ Every statement ends with a semicolon (;)
- ◆ The software colors text it understands – helpful
- ◆ Some functions include stuff inside parentheses; these are called *arguments*
- ◆ If a function has arguments, each position has a specific meaning: `size(<width>, <height>);`  
`stroke(<red value>, <green value>, <blue value>);`
- ◆ If your cursor is by a closing parenthesis or brace, the matching parenthesis or brace is highlighted

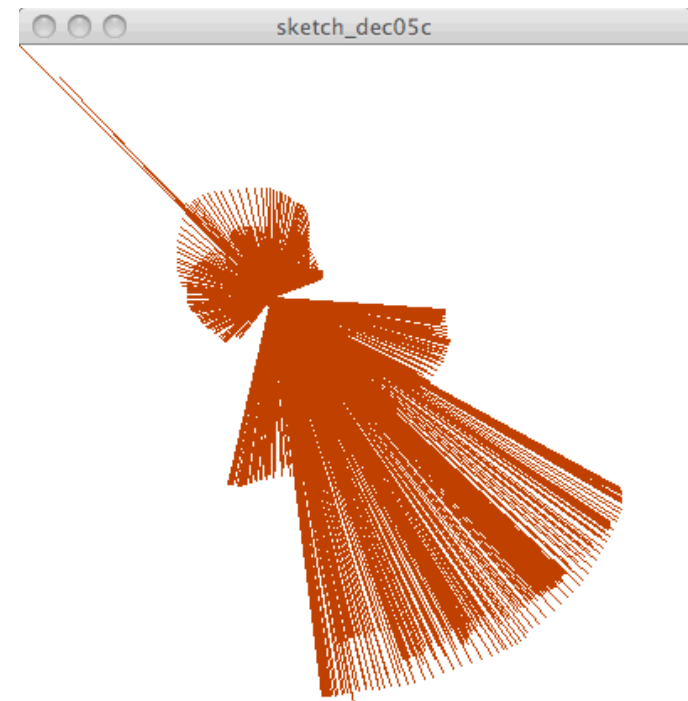
- ◆ Keywords are highlighted in blue
- ◆ Processing is case sensitive; notice!

# The Color Purple

- Colors in most Web programming are given as three values: **RGB**, for red, green, blue
- The Color Purple, for example, is: **128,0,128**
- These positions are the intensity of the little lights that make up a pixel on the screen
  - The least intensity is 0, that is, off
  - The greatest intensity is 255, maximum brightness
  - Amazingly, the three max RGB colors make **white**
  - So, purple is  $\frac{1}{2}$  intensity of **R**ed, no **G**reen, and  $\frac{1}{2}$  intensity of **B**lue ... makes sense

# Questions about “Iron Rich Snow”

- The angel is on an rust-colored background specified by: `background(192, 64, 0); ...` which means?
- Stroke sets line color: `stroke(255, 255, 255);`
- Suppose the angel is “iron rich” and the snow white
- Fill sets color of object:  
`fill(128, 0, 128);`

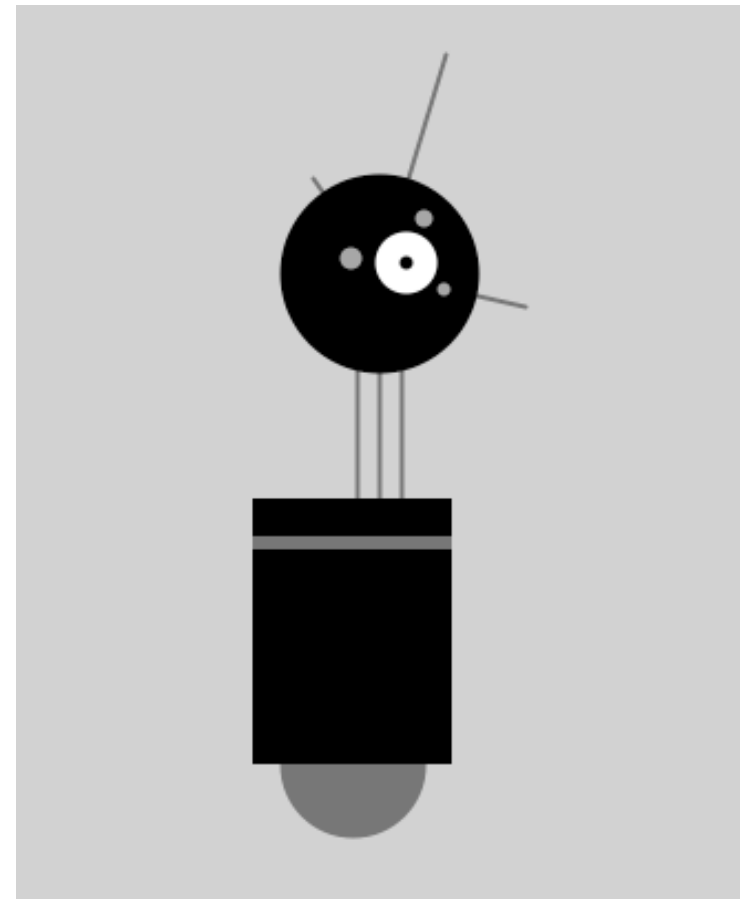


# It's All The Same

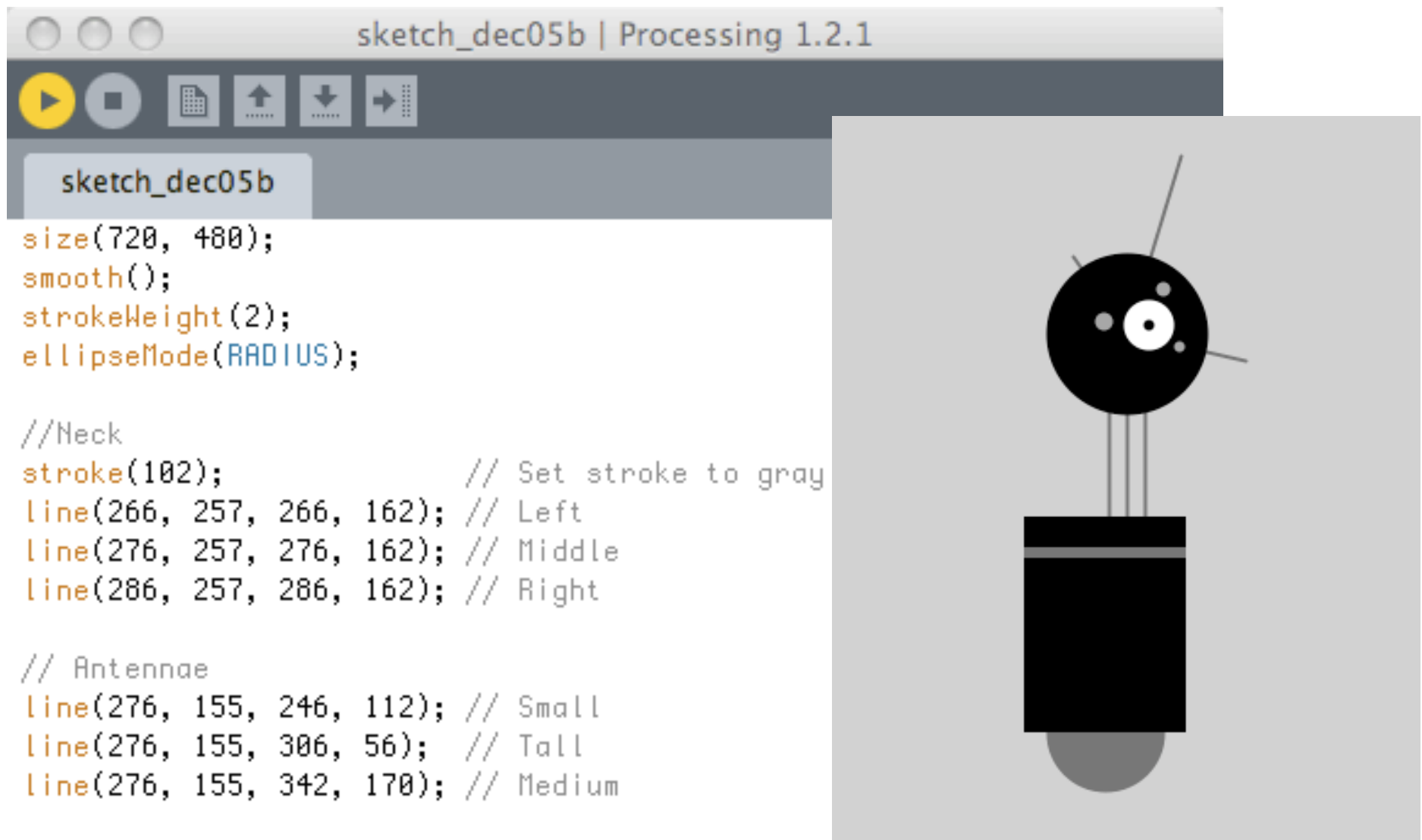
- When the values for RGB are all the same, it's some color of gray, or white, or black
- Since writing `background(255, 255, 255)` is kind of a drag, Processing allows us to give just one argument; so `background(255)` is equivalent to giving all three 255s
- What colors are these backgrounds?
  - `background(255, 0, 0);`
  - `background(64);`
  - `background(0, 0, 64);`

# Simple Shapes Make Robots

- Reas and Fry, in their book, show us a cute robot they programmed using simple shapes
- They give their code and we can see how they built it
- To make the point that **all code must “make sense”** – its not gibberish – lets look at it even though we don't know Processing yet



# Robot Code, 1



```
size(720, 480);
smooth();
strokeWeight(2);
ellipseMode(RADIUS);

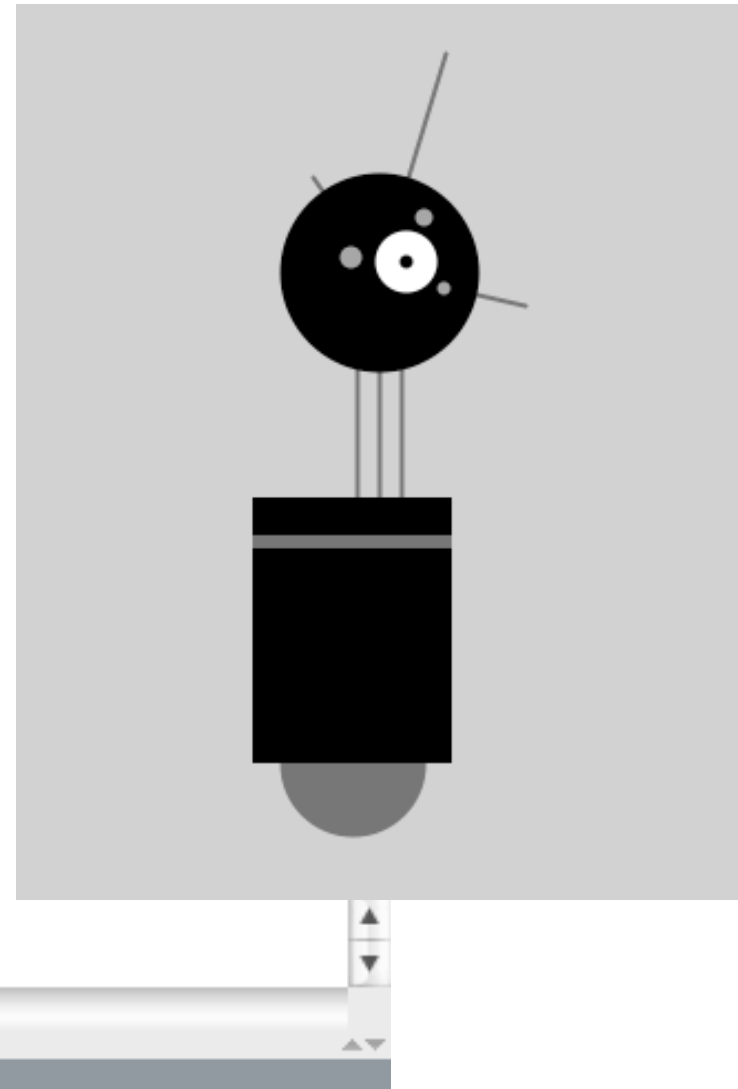
//Neck
stroke(102);           // Set stroke to gray
line(266, 257, 266, 162); // Left
line(276, 257, 276, 162); // Middle
line(286, 257, 286, 162); // Right

// Antennae
line(276, 155, 246, 112); // Small
line(276, 155, 306, 56);  // Tall
line(276, 155, 342, 170); // Medium
```

# Robot Code, 2

```
// Body
noStroke(); // Diabile stroke
fill(102); // Set to gray
ellipse(264, 377, 33, 33); // Antigravity Orb
fill(0); // Set to black
rect(219, 257, 90, 120); // Main body
fill(102); // Set back to gray
rect(219, 274, 90, 6); // Gray stripe

// Head
fill(0); // Set to black
ellipse(276, 155, 45, 45); // Head
fill(255); // Set to white
ellipse(288, 150, 14, 14); // Large eye
fill(0); // Set to black
ellipse(288, 150, 3, 3); // Pupil
fill(153); // Set to gray
ellipse(263, 148, 5, 5); // Small eye 1
ellipse(296, 130, 4, 4); // Small eye 2
ellipse(305, 162, 3, 3); // Small eye 3
```



# Knowing Only About Color ...

- We “improve” the robot by adding some color

Just Do It!

