Dr. Sarah Abraham
University of Texas at Austin
Computer Science Department

Processing:
Basic Shapes

Elements of Graphics
CS324e
Spring 2020
Processing Language

- Java-based syntax for achieving graphics functionality
- Incorporates usual programming language features:
  - Functions
  - Comments
  - Expressions
Primitive Data Types

- boolean
- byte
- char
- int
- float
- color
Example Processing Setup

```java
void setup() {
    size(200, 200);
}
```
Draw Loop

- Code inside `setup()` runs once
- Code inside `draw()` runs as a continuous loop

```java
void draw() {
    background(102);
}
```
Variable scope

- Variables declared within a block are local to that block
- Global variables are declared outside of all blocks
- What is the relationship between global variables, setup() and draw()?
Consider…

```
int x = 0;
void setup() {
    x += 3;
}

void draw() {
    x++;
}
```
Coordinate Systems

- Coordinate systems define the “space” of the scene within the computer
- Common coordinate systems:
  - World coordinate system
  - Object coordinate system
  - Camera coordinate system
  - Screen coordinate system
- Multiple coordinate systems allow for multiple levels of interaction
  - Multiple coordinate systems also require conversion between systems
Screen Coordinate System

- 2-D, pixel-based coordinate system
- Based on the size (resolution) of the screen/window
- Pixel position defined using \((x, y)\) coordinate notion
Defining Geometry in Processing

- Function `point(x, y)` defines a pixel within the window
- Function `line(x1, y1, x2, y2)` defines a line of pixels between (x1, y1) and (x2, y2)
Shape Primitives

- Other shape primitives in Processing:
  - rect\((a, b, c, d)\)
  - ellipse\((a, b, c, d)\)
  - triangle\((x_1, y_1, x_2, y_2, x_3, y_3)\)
  - quad\((x_1, y_1, x_2, y_2, x_3, y_3, x_4, y_4)\)
Curves

- \texttt{arc}(a, b, c, d, \texttt{start}, \texttt{stop})
- \texttt{bezier}(x_1, y_1, x_2, y_2, x_3, y_3, x_4, y_4)
- arc models elliptical arcs
- arc expects radians (0 to $2\pi$) rather than degrees (0 to 360) by default
- bezier models cubic Bezier curves
- Bezier curves are
  - Smooth
  - Scalable
  - Parametric
- bezierVertex can model higher order Bezier curves
Hands-on: Creating Geometry

Today’s activities:

1. Create a Processing sketch
2. Use the `point`, `line`, `rect`, `ellipse`, `triangle`, and `quad` methods at least two times each
3. Create at least one shape with the `arc` method
4. Create at least one shape with the `bezier` method

1. What makes `bezier` challenging to work directly with in code?