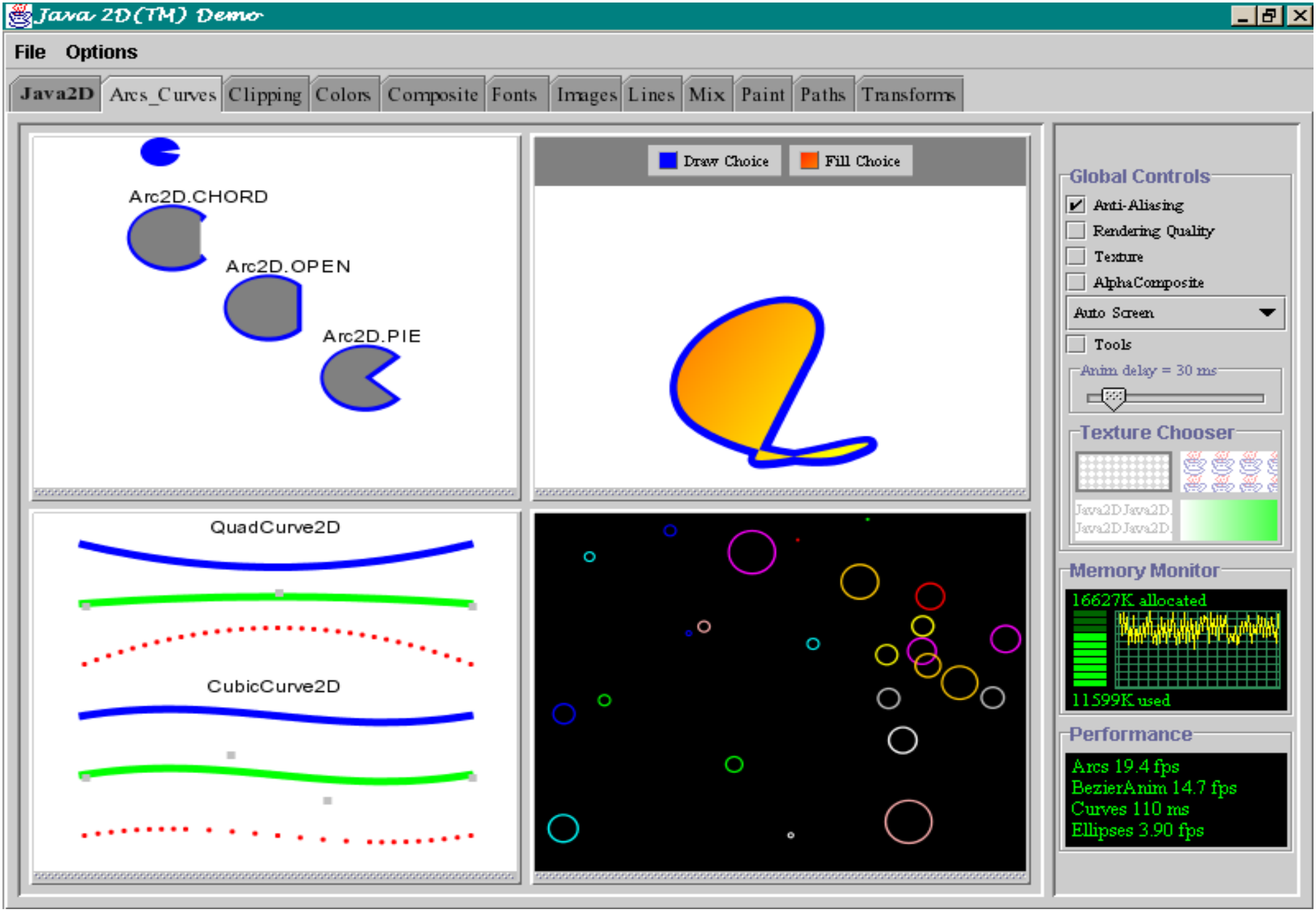
INTRODUCTION TO GRAPHICS

2011 Introduction to Graphics

Lecture 1

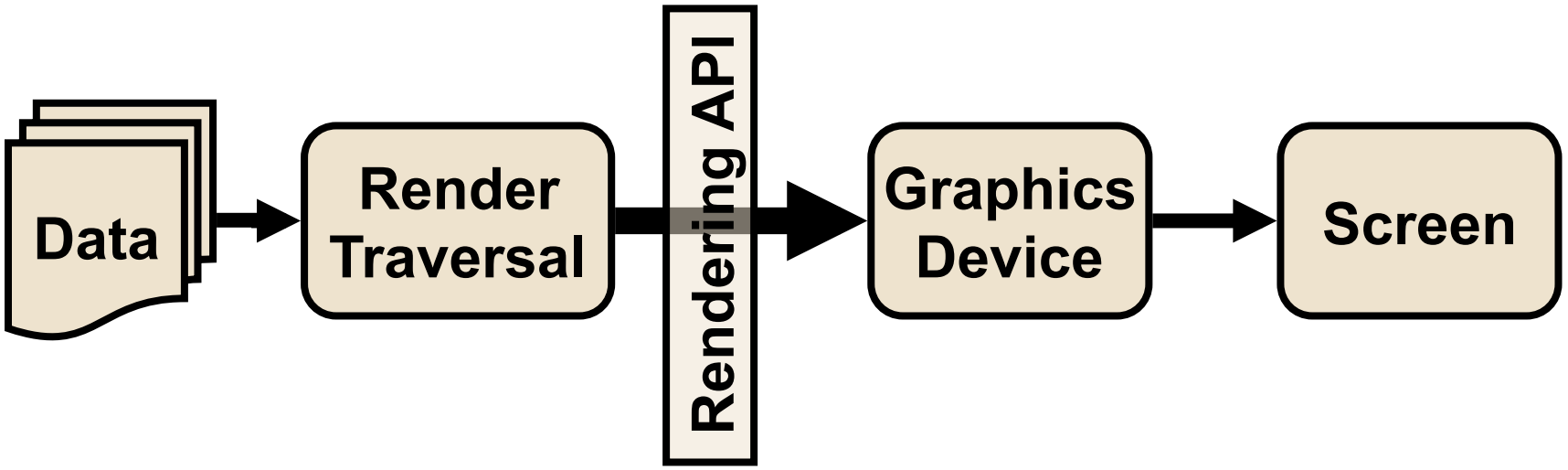
Overview

- Overview of 2D Graphics
  - pipeline
  - pixels
  - shape drawing
  - drawing style
- Java2D
  - relationships to swing
  - relationship to AWT


Java 2D(TM) Demo
File
Options
Java2D
Arcs_Curves
Clipping
Colors
Composite
Fonts
Images
Lines
Mix
Paint
Paths
Transforms
Arc2D.CHORD
Arc2D.OPEN
Arc2D.PIE
Draw Choice
Fill Choice
QuadCurve2D
CubicCurve2D
Global Controls
Anti-Aliasing
Rendering Quality
Texture
AlphaComposite
Auto Screen
Tools
Anim delay = 30 ms
Texture Chooser
Memory Monitor
16627K allocated
11599K used
Performance
Arcs 19.4 fps
BezierAnim 14.7 fps
Curves 110 ms
Ellipses 3.90 fps

How would you draw this?

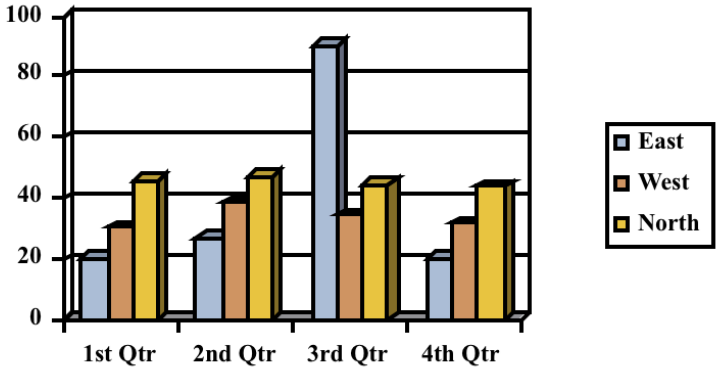
Pipeline



Application

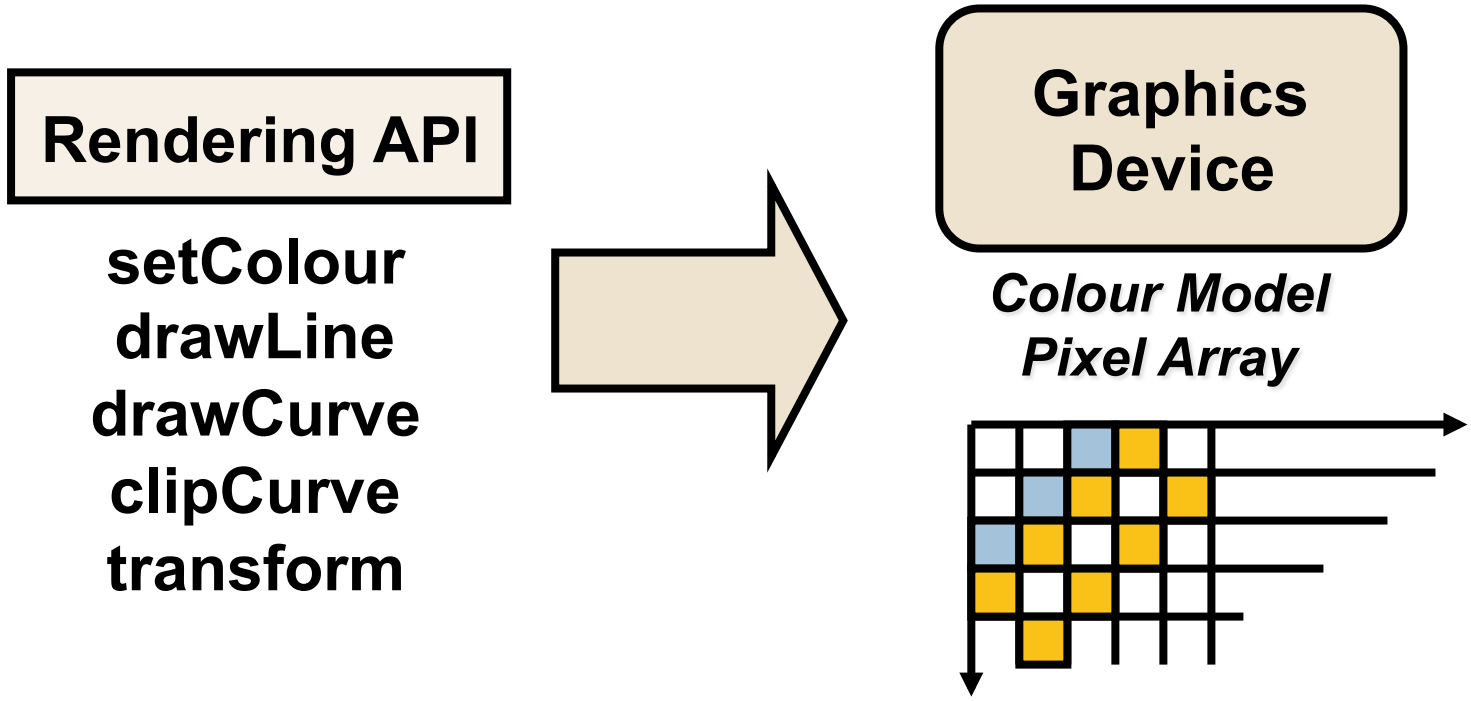
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
East	20.4	27.4	90	20.4
West	30.6	38.6	34.6	31.6
North	45.9	46.9	45	43.9

Rendering



Rendering API

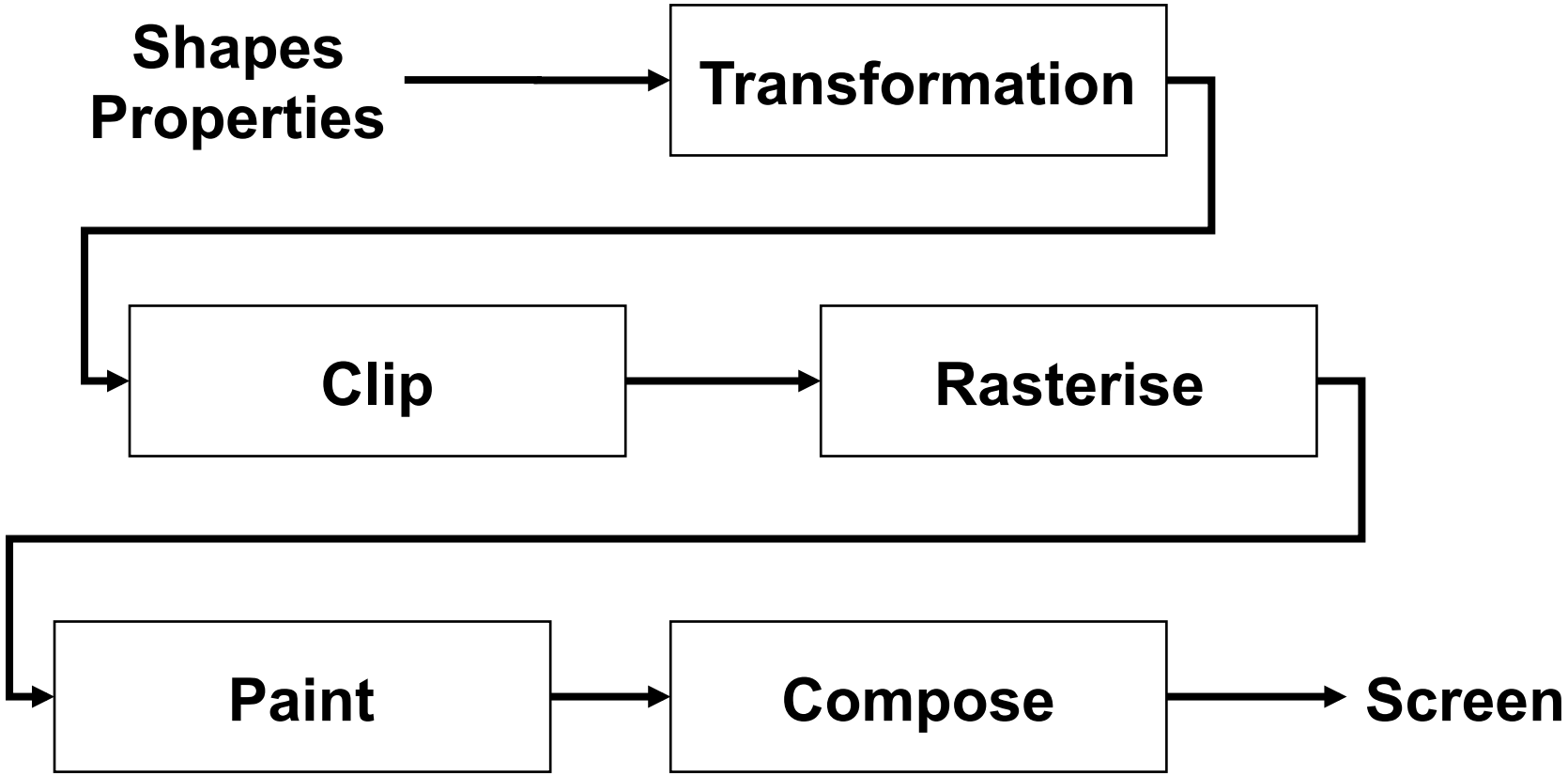
- Many and various application programming interfaces (APIs)
  - (setColour, setPixel) through to PostScript



Rendering Pipeline

- Refers to the series of steps that take a shape and produces pixels on a screen
- Graphics cards will do a different number of steps in hardware
  - The 2D API must then do the rest in software
- We will see how some operations lend themselves well to custom silicon

Rendering Pipeline

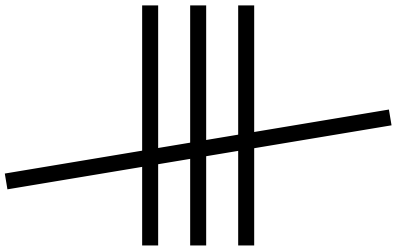


Shapes

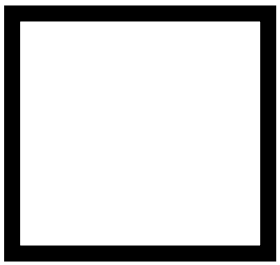
- Take the strain out of plotting pixels
- “Higher” representations scale well
  - a curve is infinitely scalable unlike a bitmap
- Many types of shape
- Many types of drawing style for shapes

Shape Types

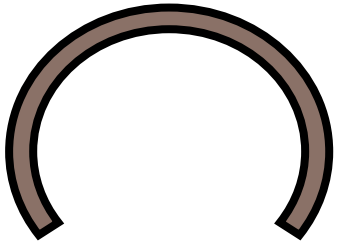
- Lines



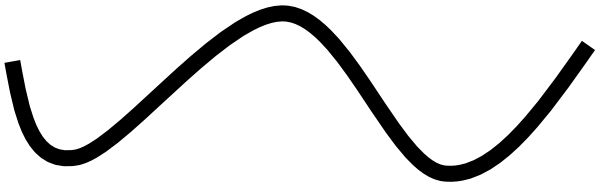
- Boxes



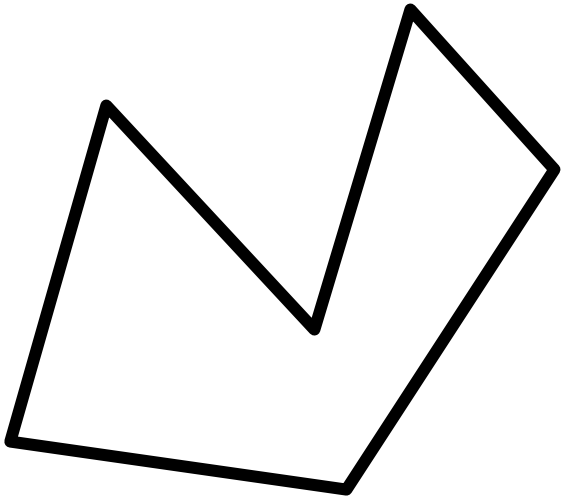
- Arcs



- Curves

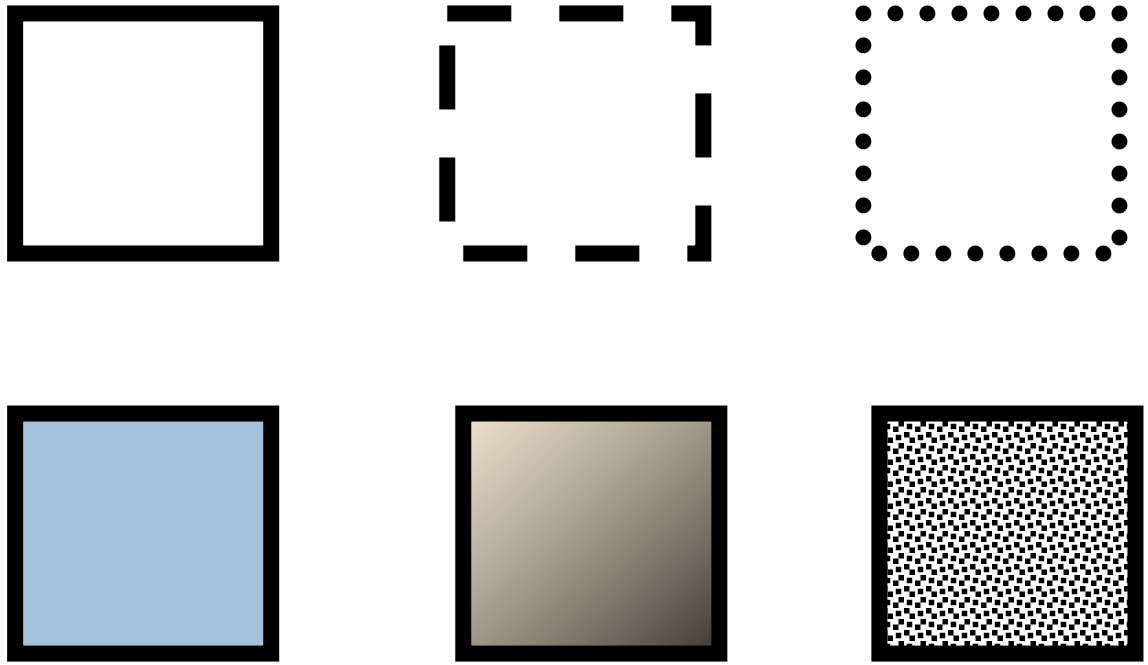


- Paths



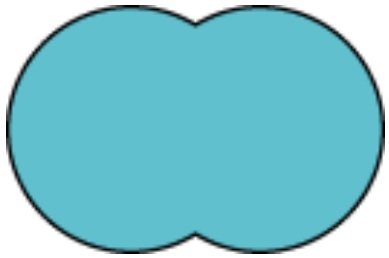
Drawing Style

- Stroke
- Fill

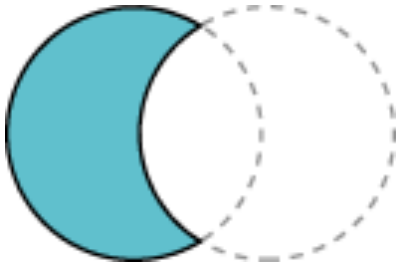


Constructive Area Geometry

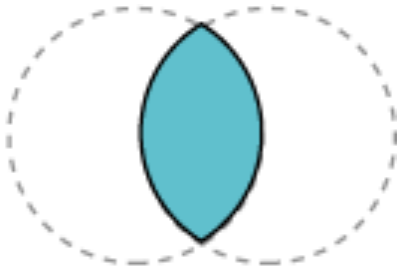
- Boolean operations on shapes



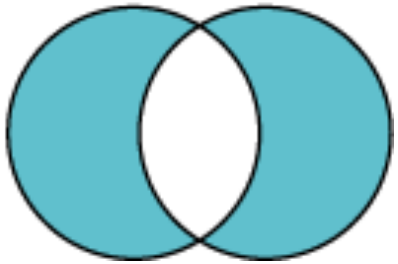
Union



Subtraction



Intersection

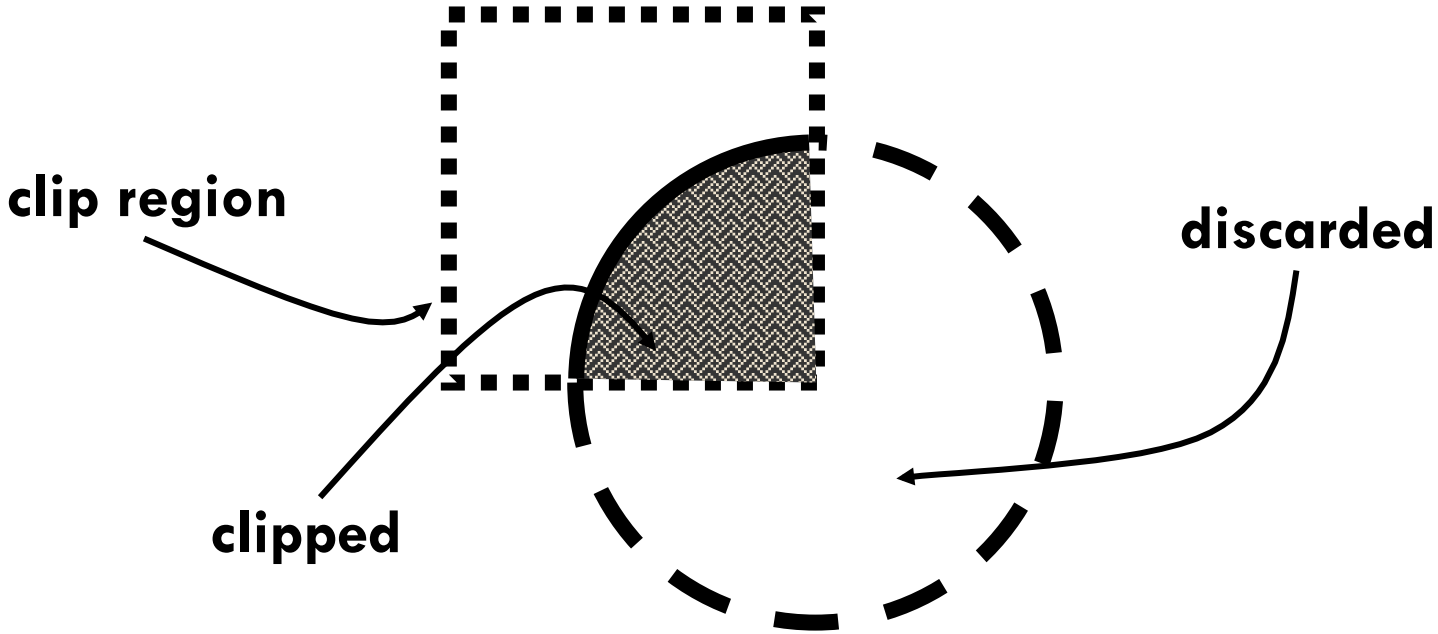


Exclusive OR

Examples from the Java 2D Tutorial Trail

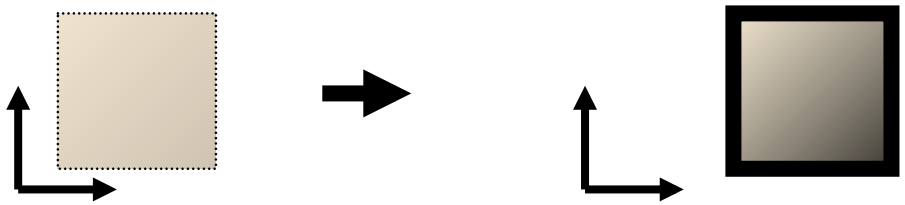
Clipping

- Prevents drawing outside **clip region**
- Clip region can be any shape

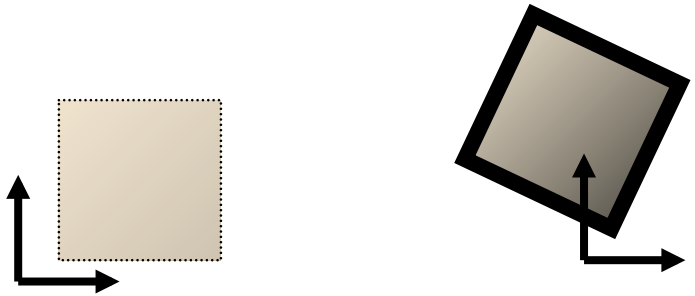


Transformations

- Translate



- Rotate (clockwise)



- Shear

Java2D

- Implements reasonably broad API
- Java2D standard since Java 1.2

- Examples:
  - http://download.oracle.com/javase/tutorial/2d/index.html

Java - the Bigger Picture

- Java2D one small piece of Java Media
- Complements Swing user-interface library
  - Swing handles both input and output of standard shapes
  - Swing is a light-weight UI toolkit
  - Use Java2D to over-ride painting methods to make more interesting widgets than the default

Resources

- Lecture notes and coursework

  http://www.cs.ucl.ac.uk/staff/J.Kautz/teaching/2011/

- Java2D
  - http://download.oracle.com/javase/tutorial/2d/index.html

Summary

- Overview of rendering pipeline
- Key concepts in 2D graphics
  - pixels
  - shape drawing
  - drawing style
- Role of the rendering API