CMSC110
Introduction to Computing

Sonu Chopra Khullar

Administrivia

CMSC110: Introduction to Computing

Fall 2014

Course Website: http://cs.brynmawr.edu/Courses/cs110/fall2014sck/
Instructor:
Sonu Chopra Khullar, (schopra@cs.brynmawr.edu or sonukhullar.bmc@gmail.com)

Lectures
Mon/Weds 11:40p to 1p in Park 278

TA-Support
>20 hrs/week in Park 231

Labs when I will be present (Optional)
Weds 2:30pm to 4:30pm in Park 231

Office Hours:
Mon/Weds 10am-11am in Park 231 or by appointment

Grading

• 7 Assignments	56%	
• In-class Quizzes	4%	
• Exam 1	18%	
• Exam 2	26%	
Total	100%	

Administrivia

Software

Processing 2.X
– Already installed in the CS Lab
– Also available for your own computer @ www.processing.org
– Processing == Java

Book

Creative Coding & Generative Art in Processing 2 by Ira Greenberg, Dianna Xu, Deepak Kumar, friendsofEd/APress, 2013. Available at the Campus Bookstore or amazon.com or other vendors.

Class Lottery

• Make sure to sign-in your name.

• If you are not "in" the lottery, indicate that. We will contact you by e-mail as soon as we have confirmation from other students.

What is Computing?

Computing: Your Parent's View

Computing: internet, e-mail, network...

Computing: Digital Photography

http://www.alanzeyes.com/2009/02/hdr-photography.html

Computing: Entertainment...

Computing: Entertainment...
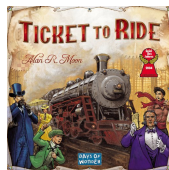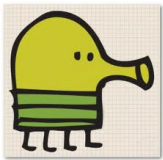
Cutting Edge Computer Science

Mapping the Epigenome

DNA contains the genetic blueprint for all human cells, but the reading and execution of the blueprint inside each cell is controlled in part by chemical markers attached to the DNA. Scientists have begun to map some of these epigenetic markers, including CpG methylation.
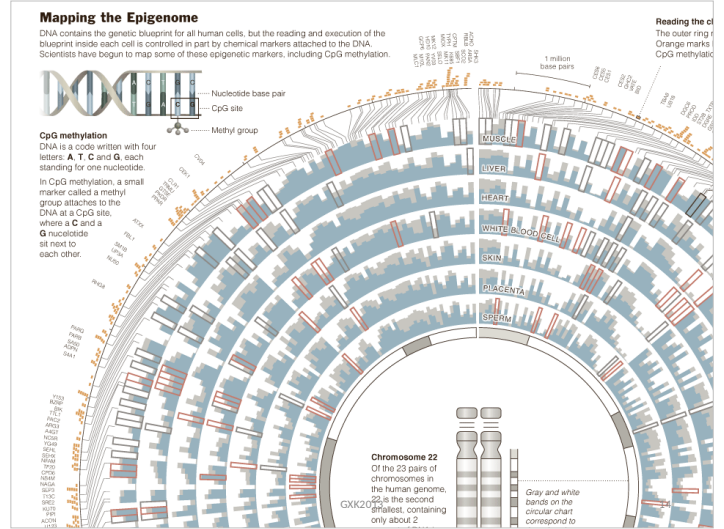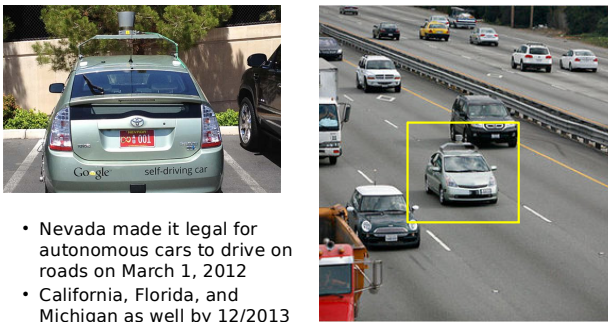
Google's Autonomous Car

- Nevada made it legal for autonomous cars to drive on roads on March 1, 2012
- California, Florida, and Michigan as well by 12/2013

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Google Driverless Car
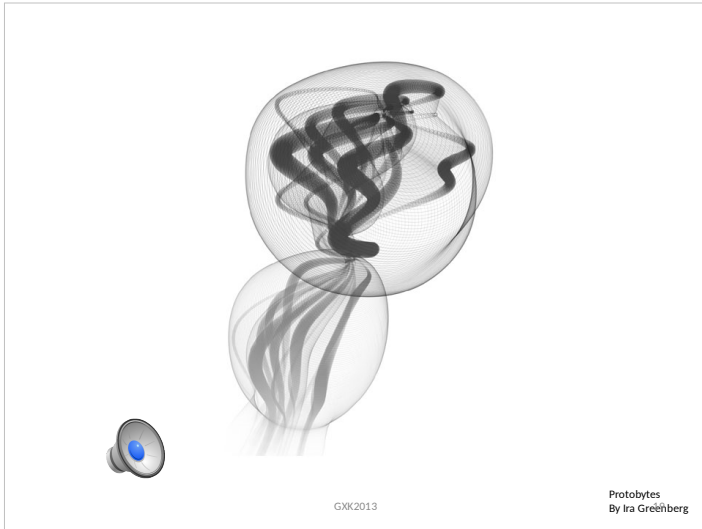## May 2014

- If video doesn't play, click here:
  https://www.youtube.com/watch?v=CqSDWoAhvLU

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2011 Jeopardy!

- In February 2011, IBM Watson bested Brad Rutter (biggest all-time money winner) and Ken Jennings (longest winning streak)
- IBM is currently applying Watson's technology to medical diagnosis and legal research

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Protobytes
By Ira Greenberg

GXK2013

Areas in Computer Science

Artificial Intelligence

Robotics

Human-Computer Interaction

Computer Graphics

Computer Vision

Operating Systems

Computer Networking

Databases

Computer Security

Ubiquitous Computing

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What is Computer Science?

Computer science is the study of solving problems using computation

- Computers are part of it, but the emphasis is on the problem solving aspect

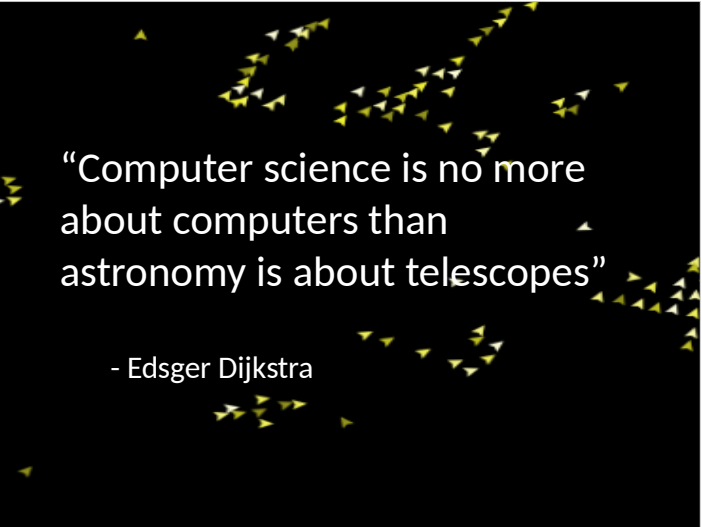Computer scientists work across disciplines:

Mathematics
Biology (bioinformatics)
Chemistry
Physics
Geology
Geoscience
Archeology

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"Computer science is no more about computers than astronomy is about telescopes"

- Edsger Dijkstra

Crowd Sourcing and 2013 App Of The Year

Mobile and Language Teaching

A Local Success Story (Penn Undergrads)

Students and Start Ups

Introduction to ^ Computing
Creative

Algorithms

An **algorithm** is an effective method for solving a problem expressed as a finite sequence of instructions. For example,

Put on shoes
  left sock
  right sock
  left shoe
  right shoe

Programming = Writing Apps

Programming is the process of designing, writing, testing, debugging / troubleshooting, and maintaining the source code of computer programs. This source code is written in a programming language.

A program

```
int areaOfCircle(int radius){
   return PI*radius*radius;
}


r = 10;
area = areaOfCircle(r);
```

Slide 31

Programming Languages

Processing	Python	Lisp

`int areaOfCircle(int radius){`
`  return PI*radius*radius;`
`}`
 	
`r = 10;`
`area = areaOfCircle(r);`
	`def areaOfCircle(radius):`
	`    return PI*radius*radius;`
	
	`r = 10`
	`area = areaOfCircle(r)`
		`(defun areaOfCircle (radius)`
		`    (return (* PI radius radius)))`
		
		`(setq r 10)`
		`(setq area (areaOfCircle r))`

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A more interesting program…

```
Eye e1, e2, e3, e4, e5;

void setup()
{
  size(200, 200);
  smooth();
  noStroke();
  e1 = new Eye( 50, 16, 80);
  e2 = new Eye( 64, 85, 40);
  e3 = new Eye( 90, 200, 120);
  e4 = new Eye(150, 44, 40);
  e5 = new Eye(175, 120, 80);
} // setup()

void draw()
{
  background(102);

  e1.update(mouseX, mouseY);
  e2.update(mouseX, mouseY);
  e3.update(mouseX, mouseY);
  e4.update(mouseX, mouseY);
  e5.update(mouseX, mouseY);

  e1.display();
  e2.display();
  e3.display();
  e4.display();
  e5.display();
} // draw()
```

```
class Eye
{
  int ex, ey;
  int size;
  float angle = 0.0;

  Eye(int x, int y, int s) {
    ex = x;
    ey = y;
    size = s;
  } // Eye()

  void update(int mx, int my) {
    angle = atan2(my-ey, mx-ex);
  } // update()

  void display() {
    pushMatrix();
    translate(ex, ey);
    fill(255);
    ellipse(0, 0, size, size);
    rotate(angle);
    fill(153);
    ellipse(size/4, 0, size/2, size/2);
    popMatrix();
  } // display()
} // class Eye
```

Slide 33

Our Goal

- Use computing to realize works of art

- Explore new metaphors from computing:
  images, animation, interactivity, visualizations

- Learn the basics of computing

- Have fun doing all of the above!

Slide 34

Introduction to ^ Computing
Creative

Computing

Visualizations   Programming

Aesthetics & Art   Algorithms

Processing/Java   Computational Media

Slide 35

Examples

Slide 36
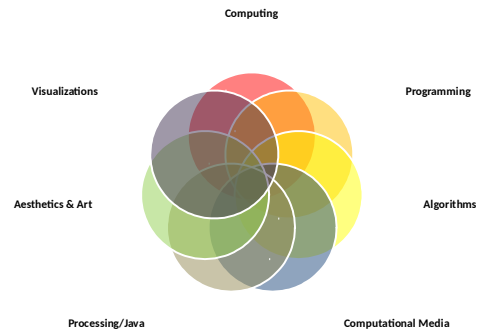
Shepard Fairey

Abstract Art

Summertime

Summertime,
And the livin' is easy
Fish are jumpin'
And the cotton is high

Your daddy's rich
And your mamma's good lookin'
So hush little baby
Don't you cry

One of these mornings
You're going to rise up singing
Then you'll spread your wings
And you'll take to the sky

But till that morning
There's a'nothing can harm you
With daddy and mamma standing by

Summertime,
And the livin' is easy
Fish are jumpin'
And the cotton is high

Your daddy's rich
And your mamma's good lookin'
So hush little baby
Don't you cry

Lyrics by George Gershwin

Word Cloud

Created using: wordle.net

World Cloud

President's Inaugural Addresses

Map-based

October 30, 2012
6:59 am EST
(time of forecast download)

top speed: **39.7 mph**
average: **8.4 mph**

Seattle
San Jose
Denver
Los Angeles
San Diego
Phoenix
Dallas
Houston
Chicago
Columbus
New York

1 mph
3 mph
5 mph
10 mph
15 mph
30 mph

Box Office Earnings

May   June   July   Aug.   Sept.   Oct.   Nov.   Dec. 2007

Each shape shows how one film did at the box office.

Height shows weekly box office revenue

Width shows longevity

The **area** of the shape (and its **color**) corresponds to the film's total domestic gross, through Feb. 21

$862 million
250
100
25
1

• Spider-Man 3
• Transformers
• The Simpsons Movie
• Shrek the Third
• Evan Almighty
• I Now Pronounce You Chuck and Larry
• Knocked Up
• Ocean's Thirteen
• The Bourne Ultimatum
• American Gangster
• Enchanted
• I Am Le...
• Juno
• Superbad
• Harry Pot...
• Nat...
• Fantastic Four: Rise of the Silver Surfer
• Live Free or Die Hard
• Rush Hour 3
• Bee Movie
• Alvin an...
Glory
• Prates of the Caribbean: At World's End
• Harry Potter and the Order of the Phoenix
• Ratatouille

From: **The Ebb and Flow of Movies: Box Office Receipts 1986 — 2008**
nytimes.com
February 23, 2008

Our Goal

- Use computing to realize works of art

- Explore new metaphors from computing: images, animation, interactivity, visualizations

- Learn the basics of computing

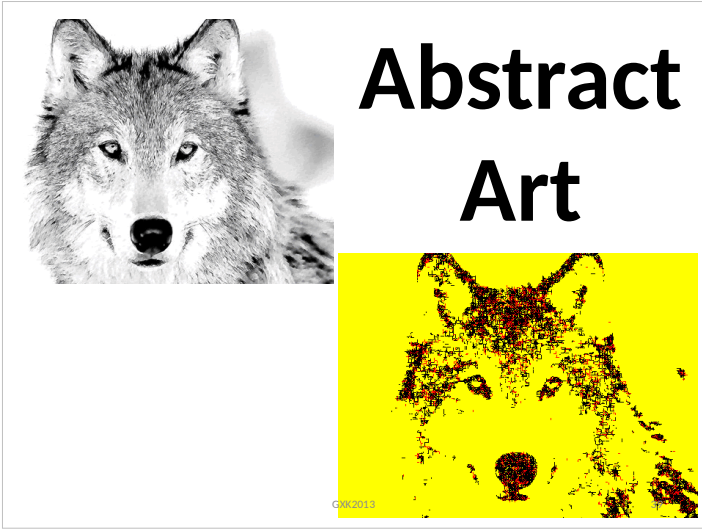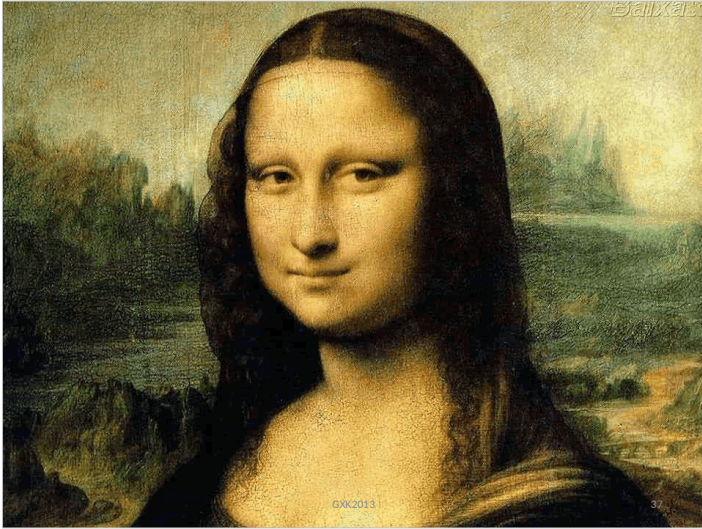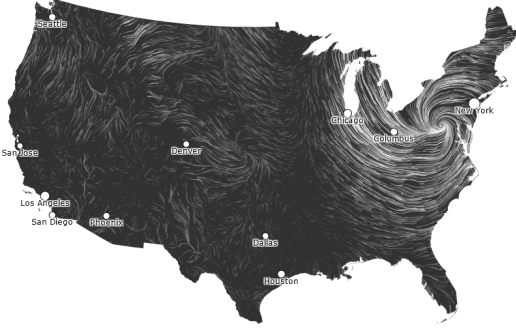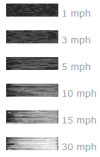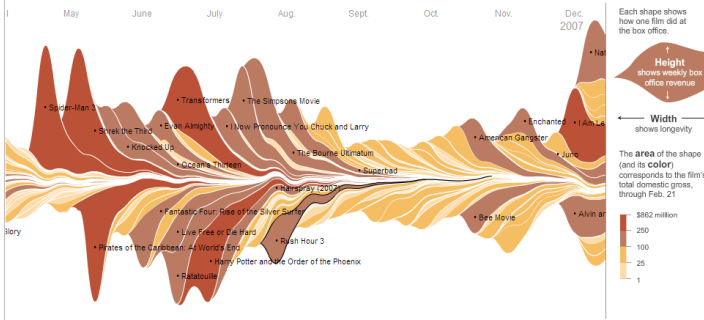- Have fun doing all of the above!
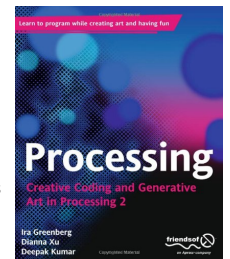

Let's get started...

Administrivia

Software

Processing 2.X
– Already installed in the CS Lab
– Also available for your own computer @ www.processing.org
– Processing == Java

Book

Creative Coding & Generative Art in Processing 2
by Ira Greenberg, Dianna Xu, Deepak Kumar, friendsofEd/APress, 2013. Available at the Campus Bookstore or amazon.com or other vendors.

Homework

- Go the CS Computer Lab (Room 231 PSB)
- Log in
- Start the Processing application
  (Make sure it is Version 2.x)
- In a web browser, go to the Tutorials section of processing.org

 http://www.processing.org/tutorials/gettingstarted/

- Read the Getting Started tutorial (by Casey Reas & Ben Fry) and try out the two examples of simple Processing programs presented there
- If you'd like, install Processing 2.x on your own computer
- Read Chapter 1 (Read pages 1-12, skim 12-32)

Processing 2.0 IDE

Menu bar
Tool bar
Tab strip
Text editor
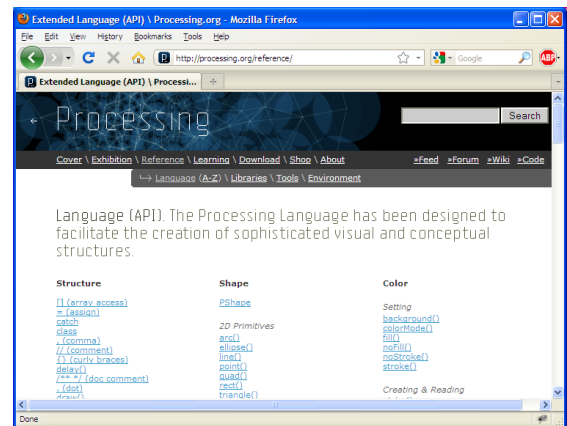Display Window
Message area
Console
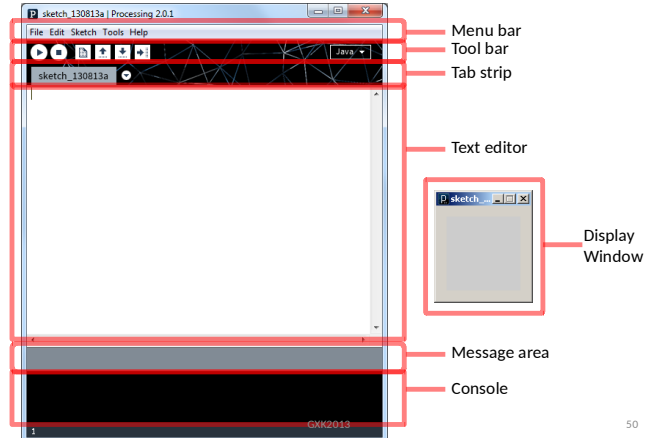
Primitive 2D Shapes

- point
- line
- triangle
- rect   (rectangle)
- quad   (quadrilateral, four-sided polygon)
- ellipse
- arc   (section of an ellipse)
- curve(Catmull-Rom spline)
- bezier   (Bezier curve)
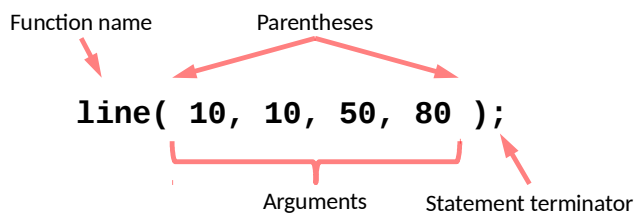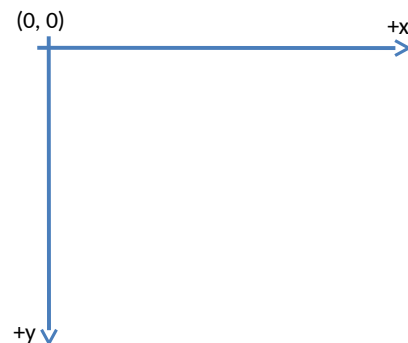
---

http://processing.org/reference/

Anatomy of a Function Call

Function name   Parentheses

line(10, 10, 50, 80);

Arguments   Statement terminator

Coordinate System

(0, 0)   +x

+y

Pixels
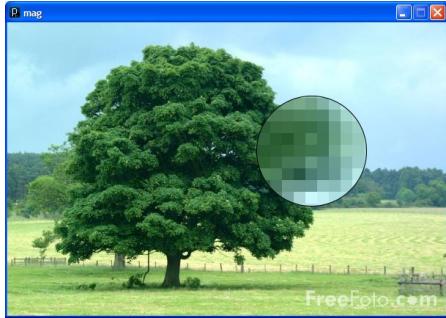
Processing Canvas

size(*width*, *height* **);**
  Set the size of the canvas.

background(*[0..255]* **);**
  Set the background grayscale color.

Drawing Primitives

```
point( x, y );

line( x1, y1, x2, y2 );

triangle( x1, y1, x2, y2, x3, y3 );

quad( x1, y1, x2, y2, x3, y3, x4, y4 );

rect( x, y width, height );

ellipse( x, y, width, height );
```
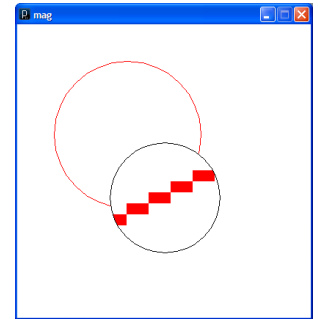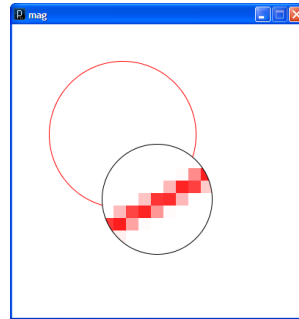
smooth() vs. noSmooth()

Colors

Composed of four elements:
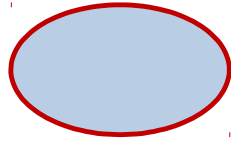
1. Red
2. Green
3. Blue
4. Alpha (Transparency)

Why 0 .. 255?

Shape Formatting

1. Fill color
2. Line thickness
3. Line color

These are properties of your <u>paintbrush</u>, not of the object you are painting.

Fill Color

```
fill(gray);
fill(gray, alpha);
fill(red, green, blue);
fill(red, green, blue, alpha);

noFill();
```

Stroke (Line) Color

```
stroke(gray);
stroke(gray, alpha);
stroke(red, green, blue);
stroke(red, green, blue, alpha);

noStroke();
```

---

strokeCap()

```
smooth();
strokeWeight(12.0);
strokeCap(ROUND);
line(20, 30, 80, 30);
strokeCap(SQUARE);
line(20, 50, 80, 50);
strokeCap(PROJECT);
line(20, 70, 80, 70);
```

strokeWeight()

```
smooth();
strokeWeight(1);   // Default
line(20, 20, 80, 20);
strokeWeight(4);   // Thicker
line(20, 40, 80, 40);
strokeWeight(10);  // Beastly
line(20, 70, 80, 70);
```

http://processing.org/reference/strokeCap_.html
http://processing.org/reference/strokeWeight_.html

---

ellipseMode

```
ellipseMode(CENTER);
ellipse(35, 35, 50, 50);
ellipseMode(CORNER);
fill(102);
ellipse(35, 35, 50, 50);
```

rectMode

```
rectMode(CENTER);
rect(35, 35, 50, 50);
rectMode(CORNER);
fill(102);
rect(35, 35, 50, 50);
```

http://processing.org/reference/ellipseMode_.html
http://processing.org/reference/rectMode_.html

KODAK Gray Scale

C Y M

Kodak

A	1	2	3	4	5	6	M	8	9	10	11	12	13	14	15	B	17	18	19

0	12	25	38	51	63	76	89	100	114	127	140	153	165	178	191	204	216	229	242	255

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