

nputing

[illegible]

Deepak Kumar

Administrivia

CMSC 110: Introduction to Computing Spring 2013

Course Website: <http://www.cs.brynmawr.edu>

Co-Instructors:

Paul Ruvolo, Ph.D. (pruvolo@cs.brynmawr.edu)

Deepak Kumar, Ph.D. (dkumar@cs.brynmawr.edu)

Lectures

TuTh 2:15p to 3:45p in Park 338

TA-Support

>20 hrs/week in Park 231

Open Labs (Optional)

Wed 1:30p to 3:30p in Park 231

Office Hours

Available by appointment. Walk-ins are welcome!

Grading

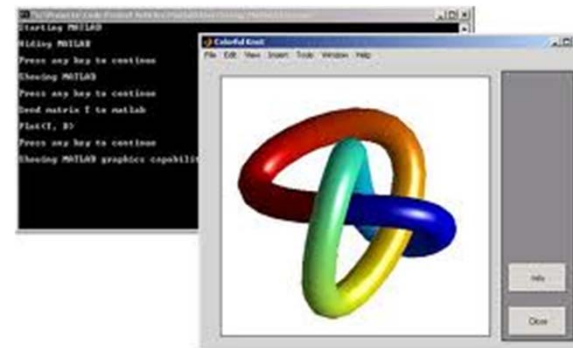
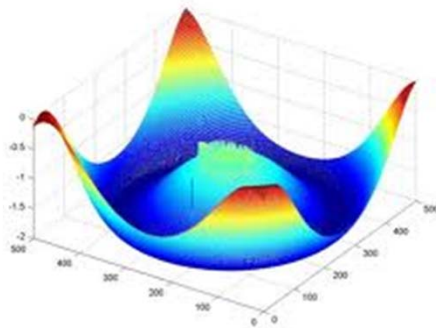
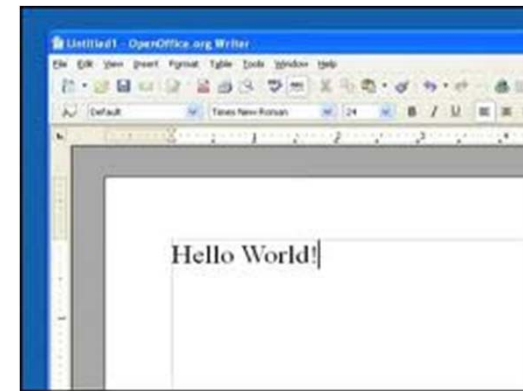
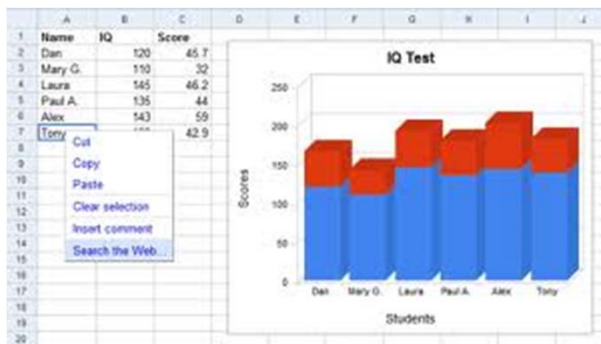
• 7 Assignments	56%
• In-class Quizzes	4%
• Exam 1	18%
• Exam 2	22%
<hr/>	
Total	100%

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...



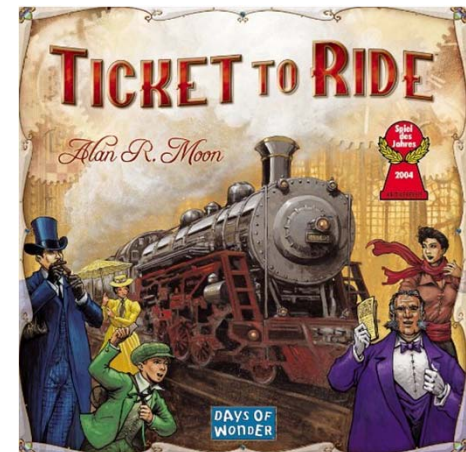
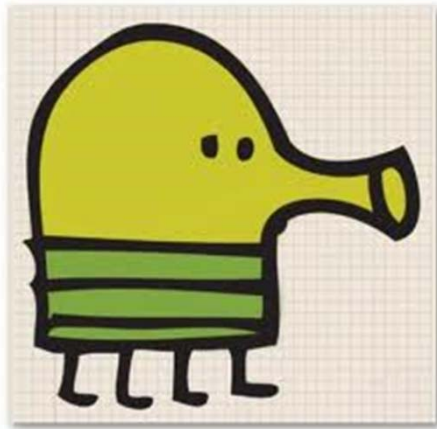
Computing: Digital Photography

<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.

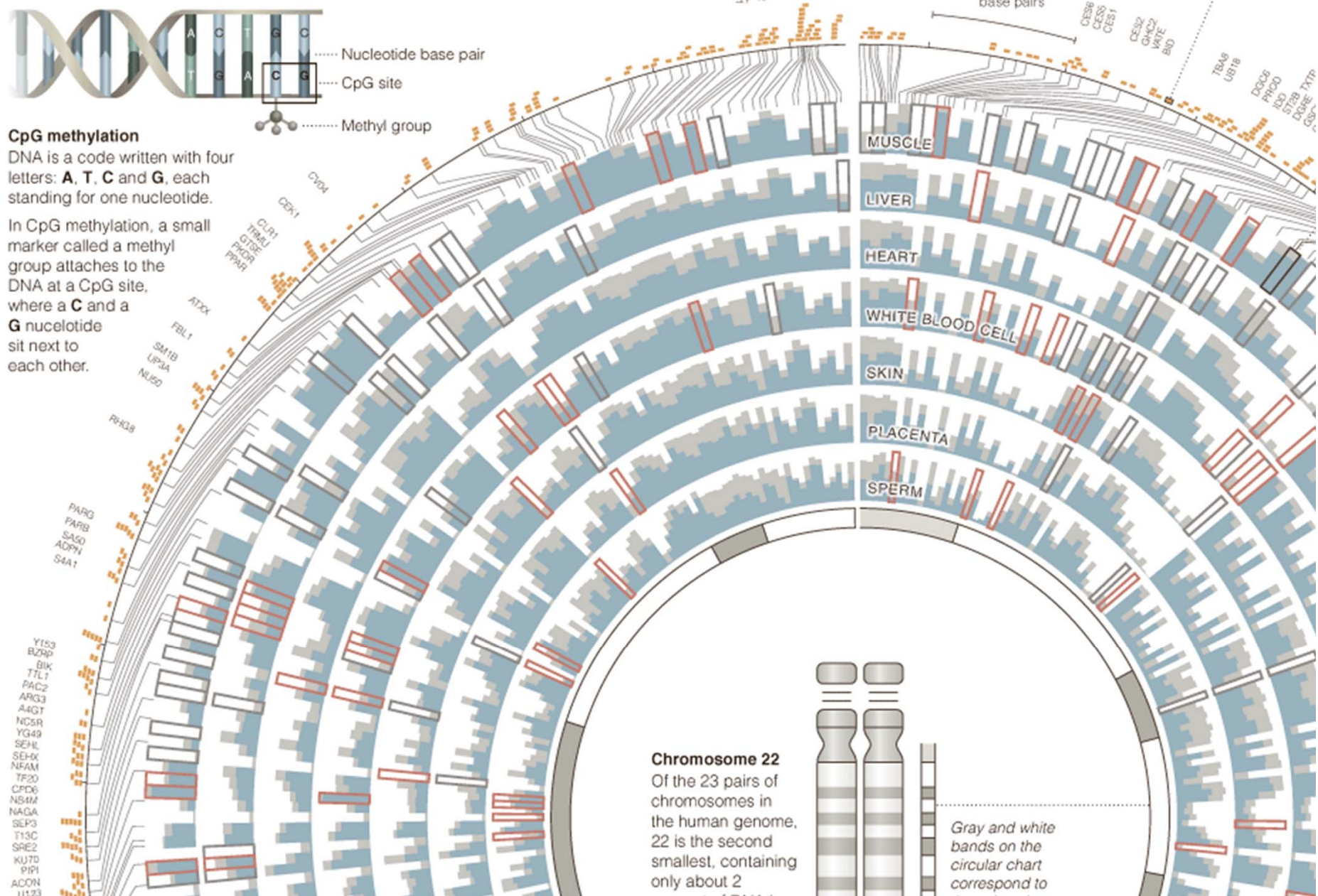
CpG methylation

DNA is a code written with four letters: **A**, **T**, **C** and **G**, each standing for one nucleotide.

In CpG methylation, a small marker called a methyl group attaches to the DNA at a CpG site, where a **C** and a **G** nucleotide sit next to each other.

Reading the ct

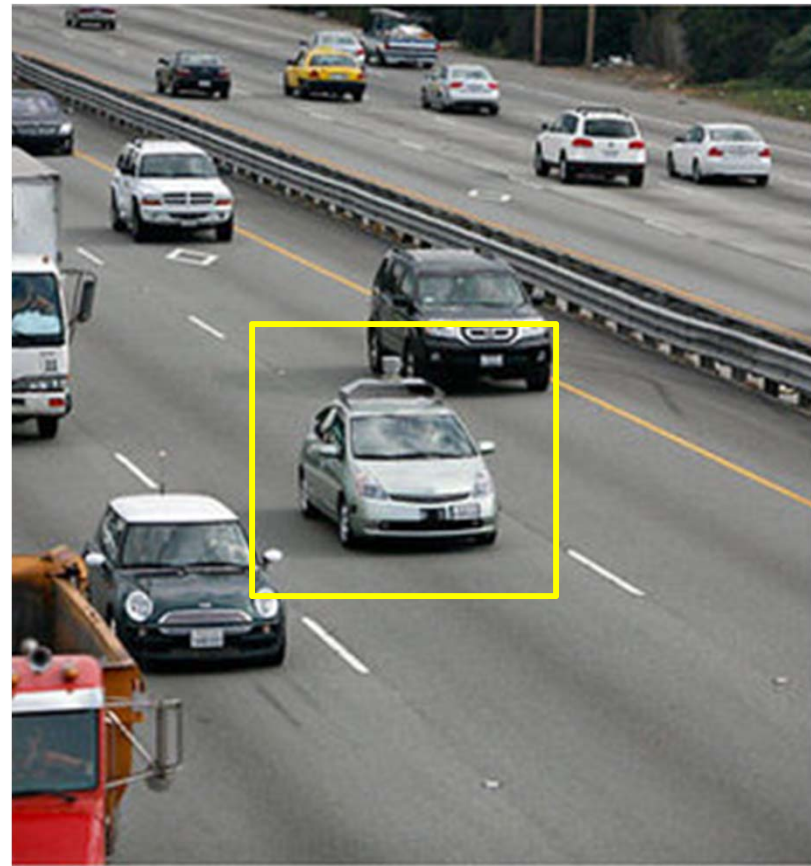
The outer ring represents the CpG methylation level. Orange marks the CpG methylation level.



Google's Autonomous Car



- Nevada made it legal for autonomous cars to drive on roads in June 2011
- California introduced a similar bill in Aug 2012



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

Robot Soccer



RoboCup International Robotics Competition
<http://www.robocup.org/>



Bryn Mawr Robot Soccer Team

ART



Protobytes
By Ira Greenberg

Areas in Computer Science



Artificial
Intelligence



Robotics



Human-Computer
Interaction



Computer
Graphics



Computer
Vision



Operating
Systems



Computer
Networking



Databases



Computer
Security



Ubiquitous
Computing

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

Psychology

Sociology

Cognitive Science

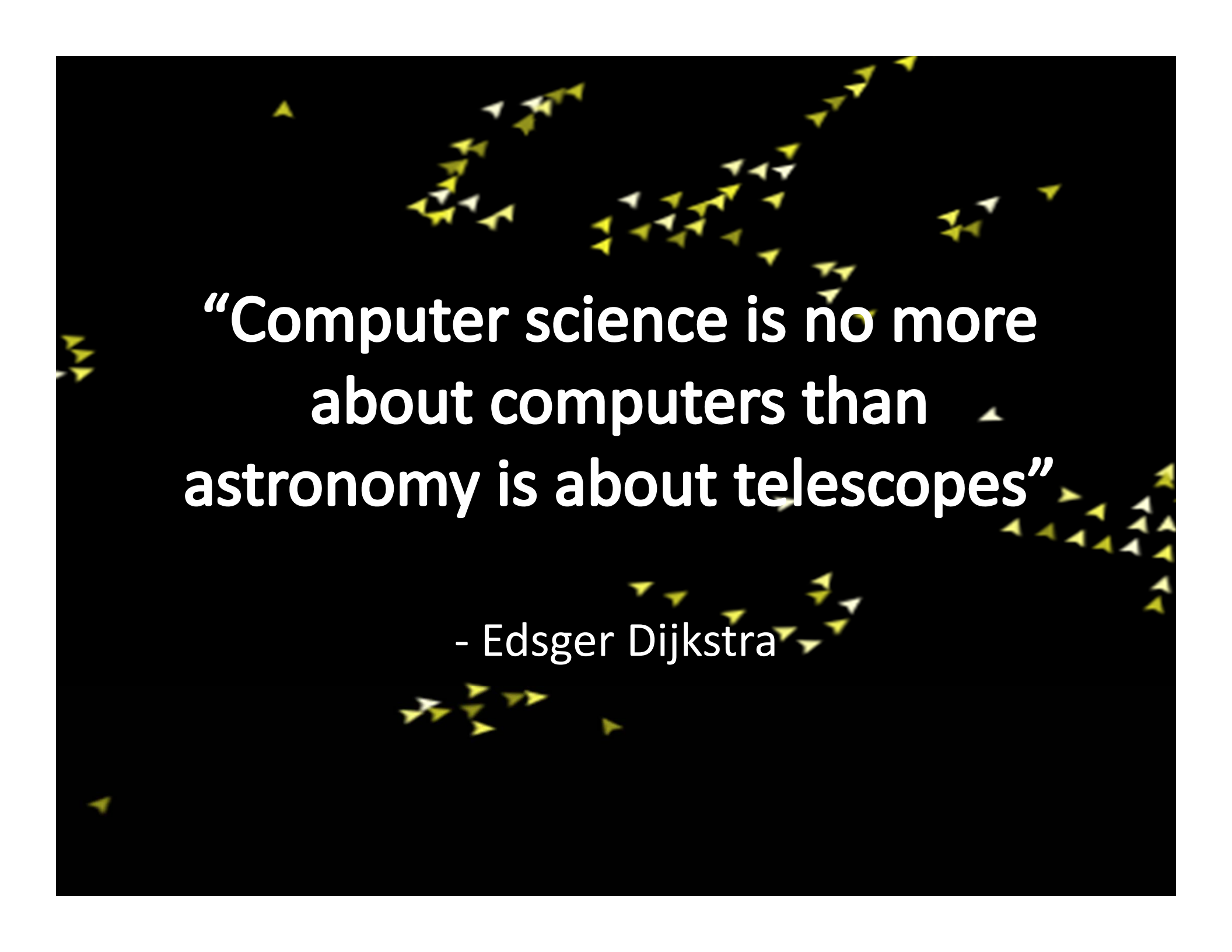
Medicine/Surgery

Engineering

Linguistics

Art

...



**“Computer science is no more
about computers than
astronomy is about telescopes”**

- Edsger Dijkstra

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Hands-On Sessions

Meet in computer labs (Park 231)

Open Labs (Optional)

Wed 1:30p to 3:30p in Park 231

Grading

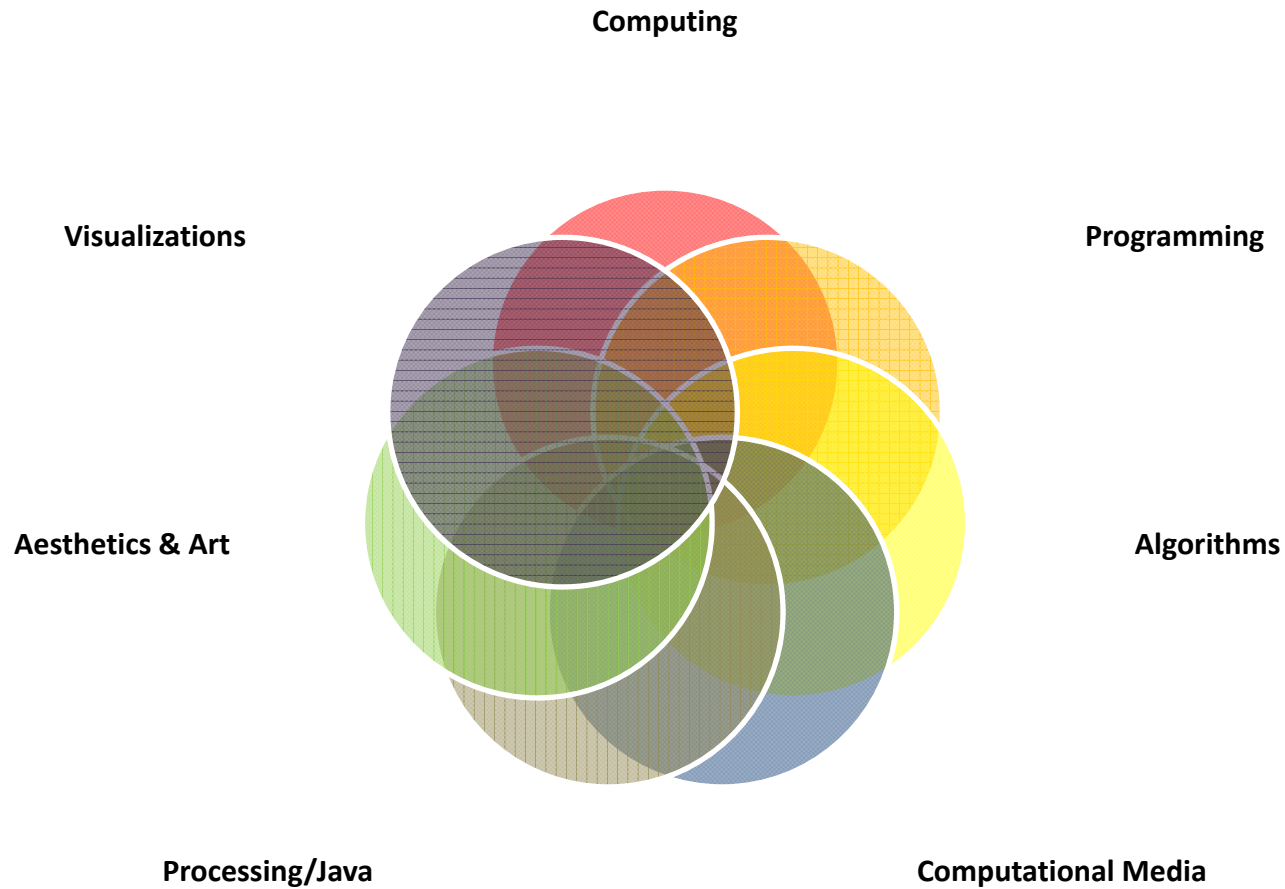
• 7 Assignments	56%
• In-class Quizzes	4%
• Exam 1	18%
• Exam 2	22%
<hr/>	
Total	100%

Office Hours

Paul Ruvolo: Tues/Wed 1:30-2:30 pm and by appointment in Park 246-D

Deepak Kumar: Mondays 1:30-2:30p in Park 246-B

Introduction to ^{Creative} Computing



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);
```

Programming Languages

Processing	Python	Lisp
<pre>int areaOfCircle(int radius){ return PI*radius*radius; } r = 10; area = areaOfCircle(r);</pre>	<pre>def areaOfCircle(radius): return PI*radius*radius; r = 10 area = areaOfCircle(r)</pre>	<pre>(defun areaOfCircle (radius) (return (* PI radius radius))) (setq r 10) (setq area (areaOfCircle r))</pre>

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);
}

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();
}
```

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

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

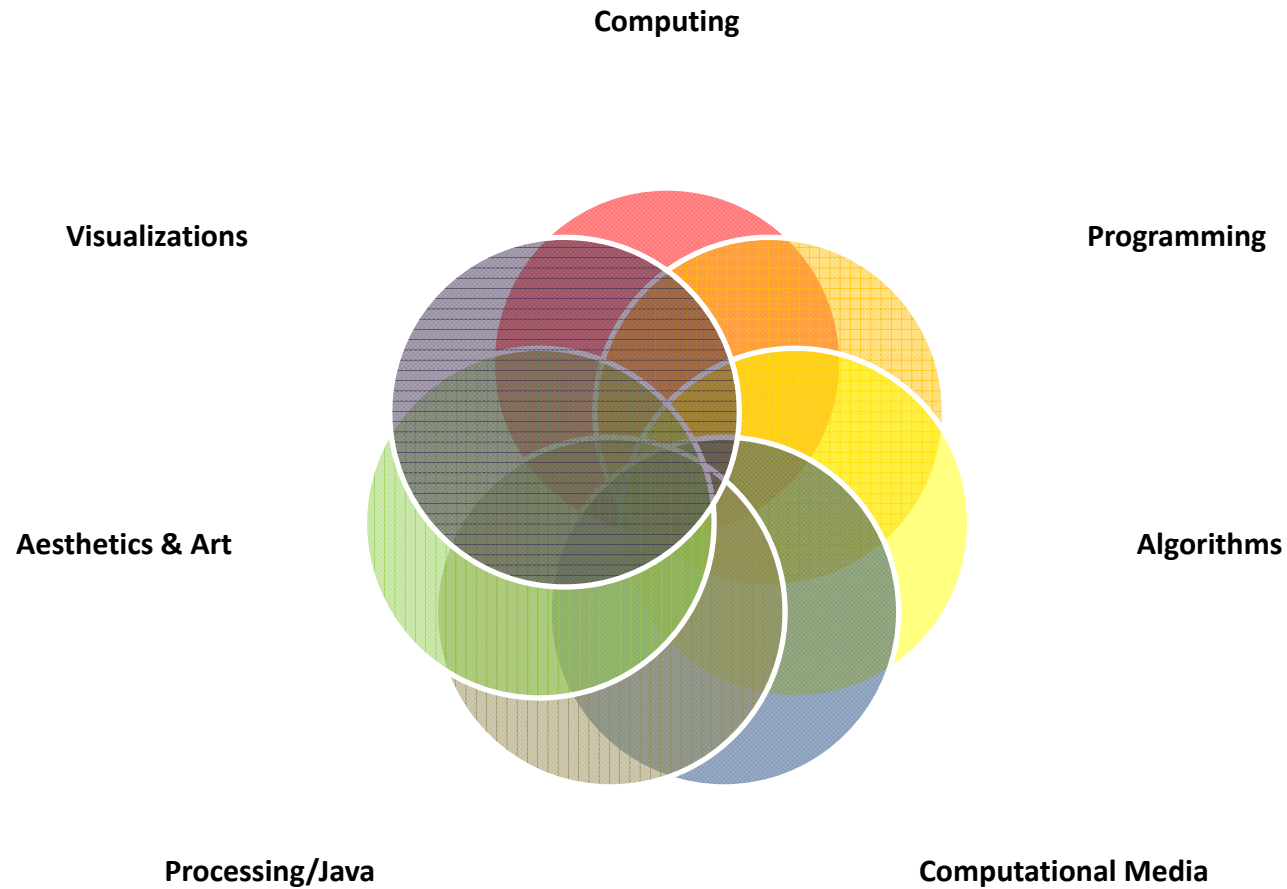
  void update(int mx, int my) {
    angle = atan2(my-ey, mx-ex);
  }

  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();
  }
}
```

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!

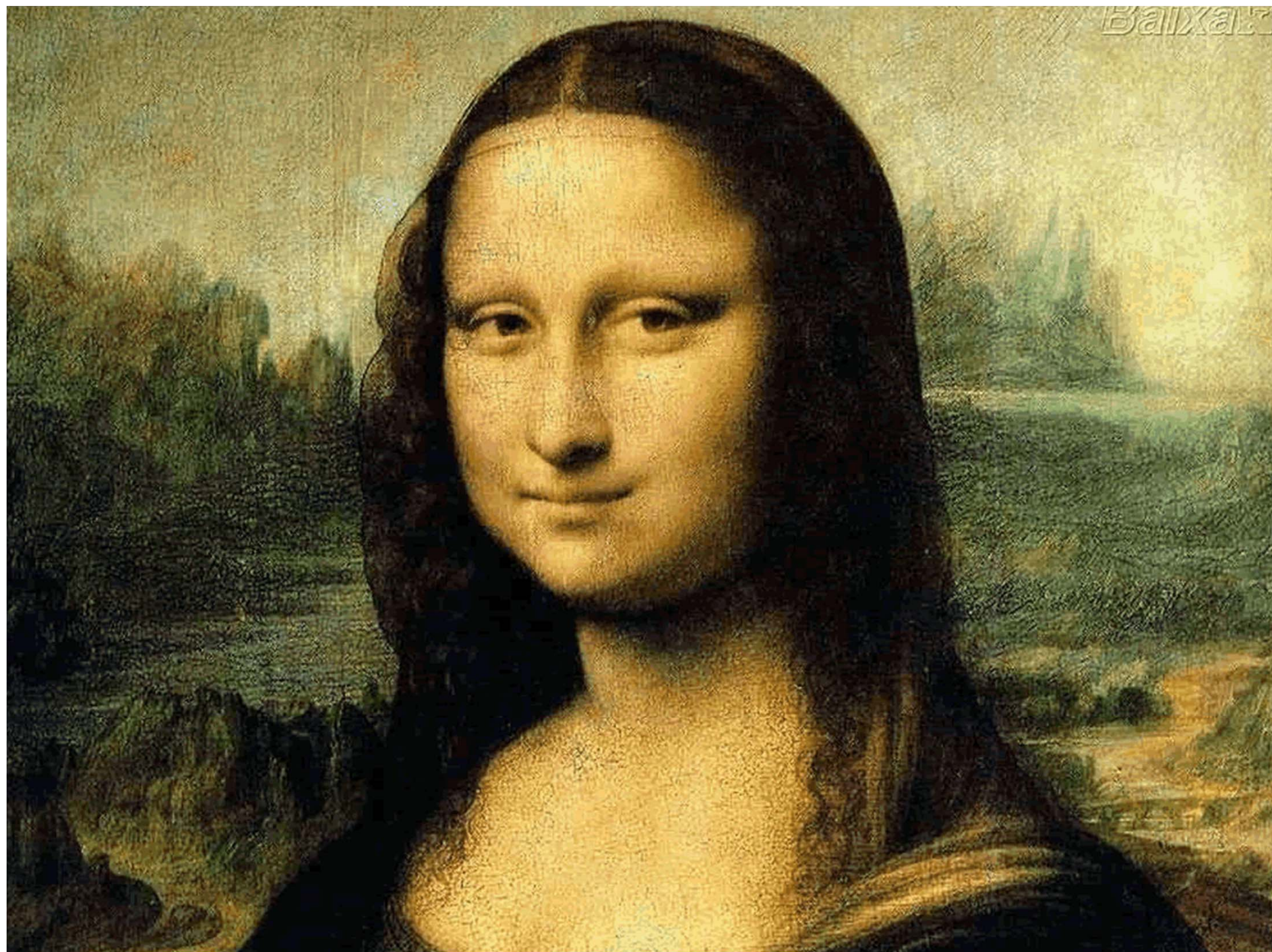
Introduction to ^{Creative} Computing

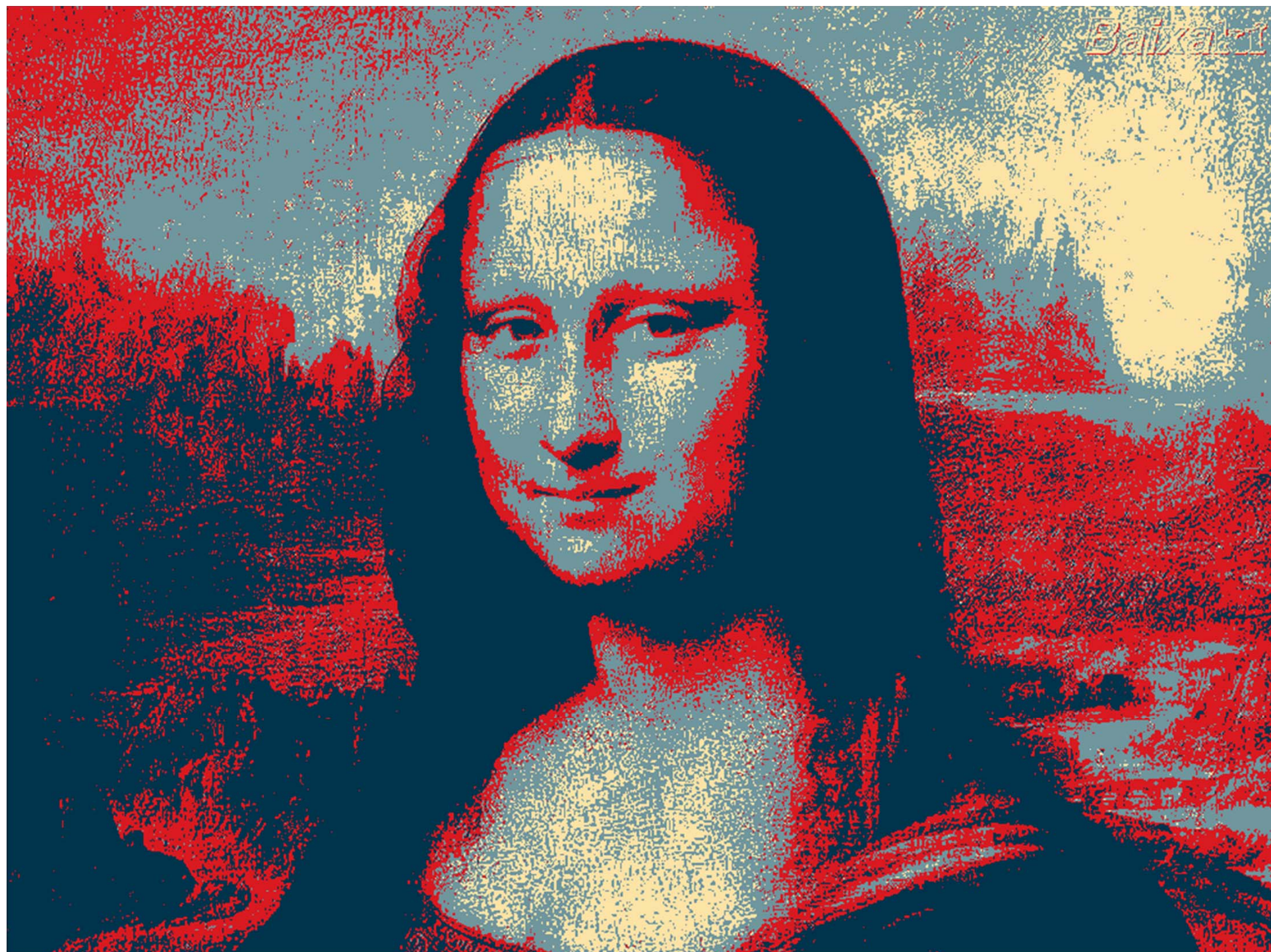


Examples

Shepard Fairey



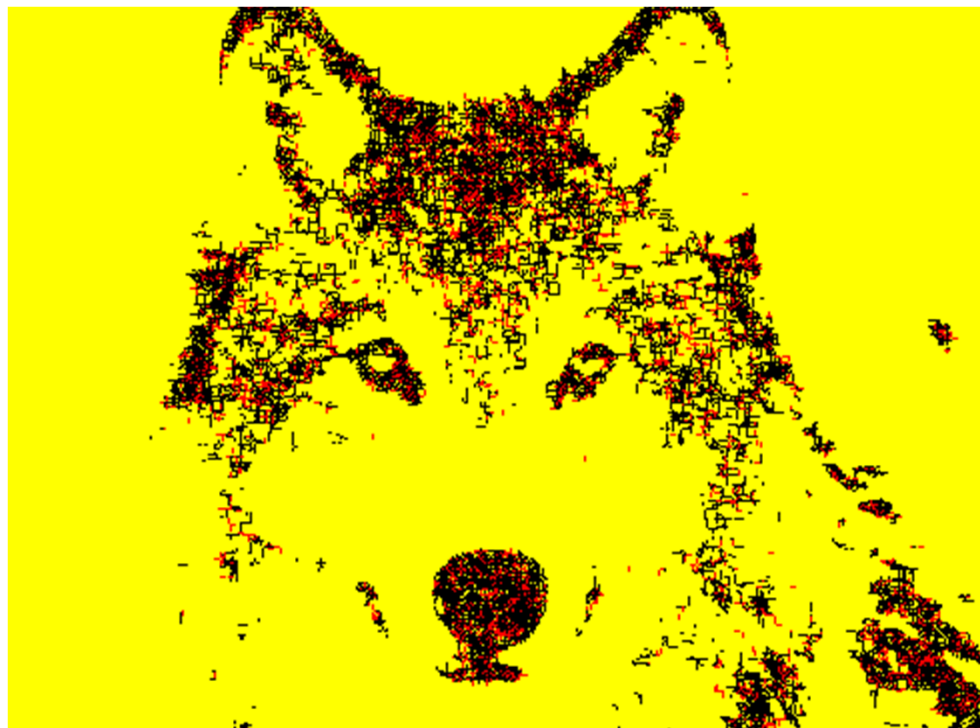




Baizart



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

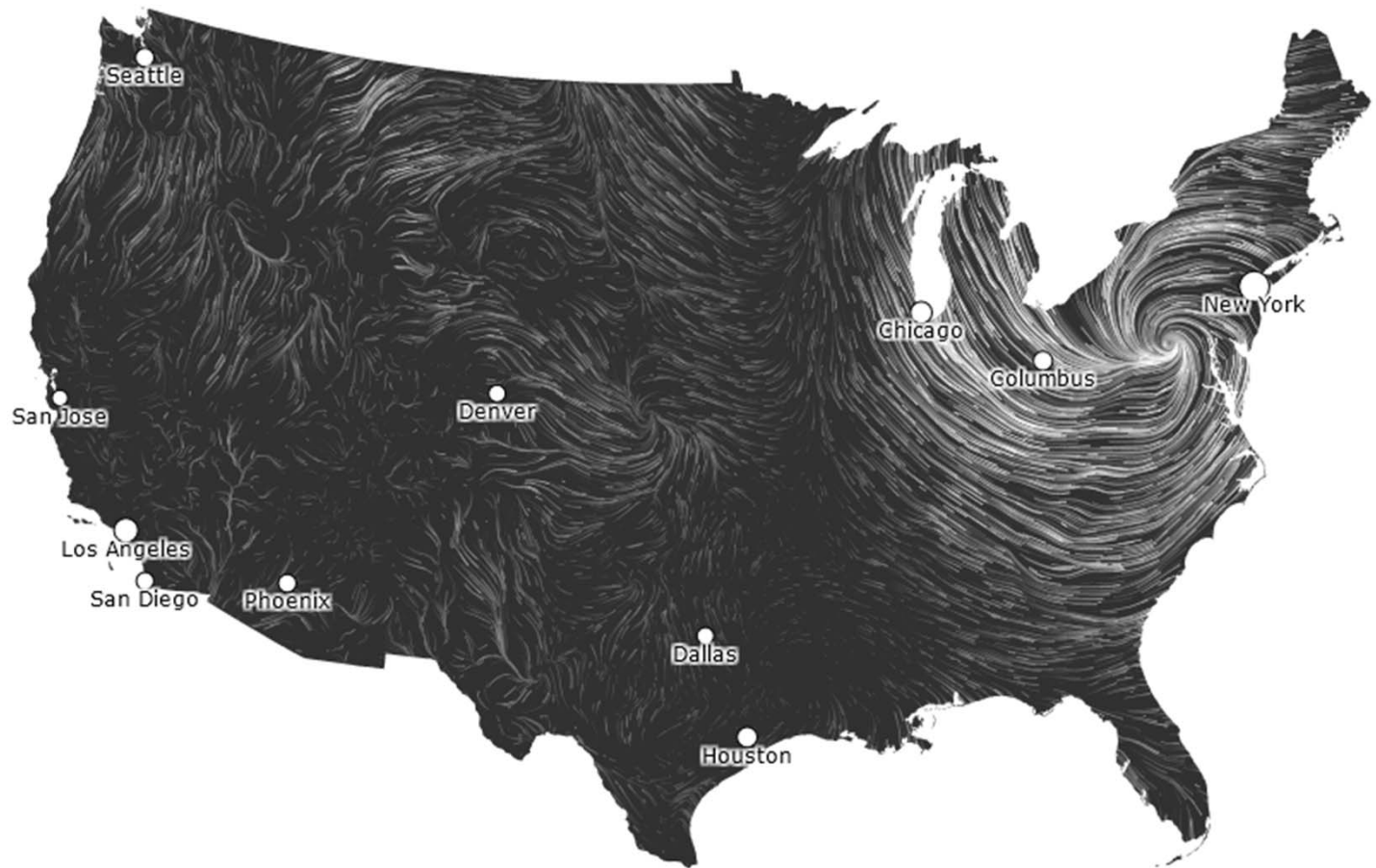
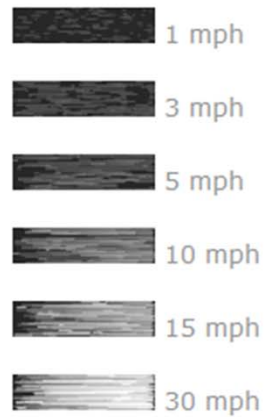
October 30, 2012

6:59 am EST

(time of forecast download)

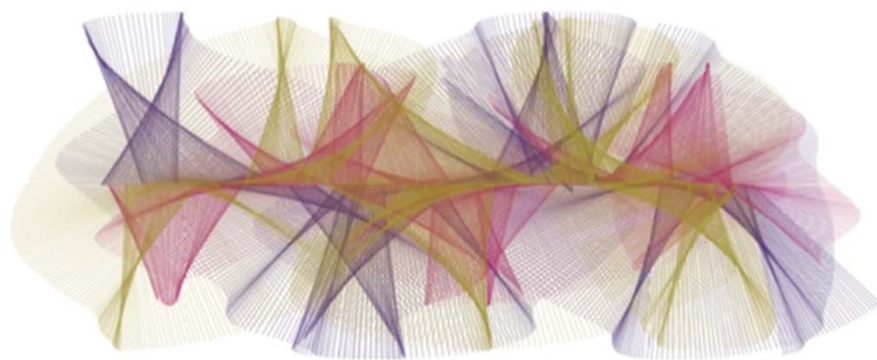
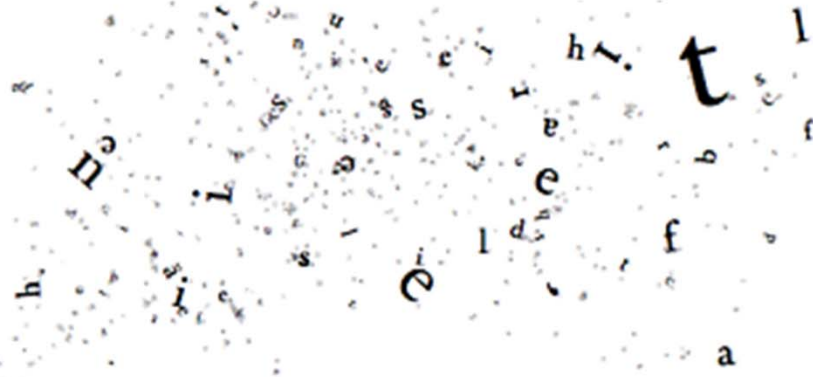
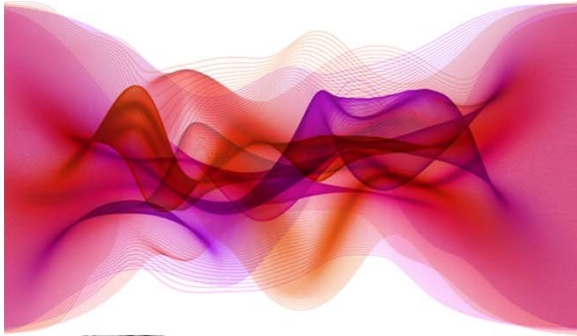
top speed: **39.7 mph**

average: **8.4 mph**

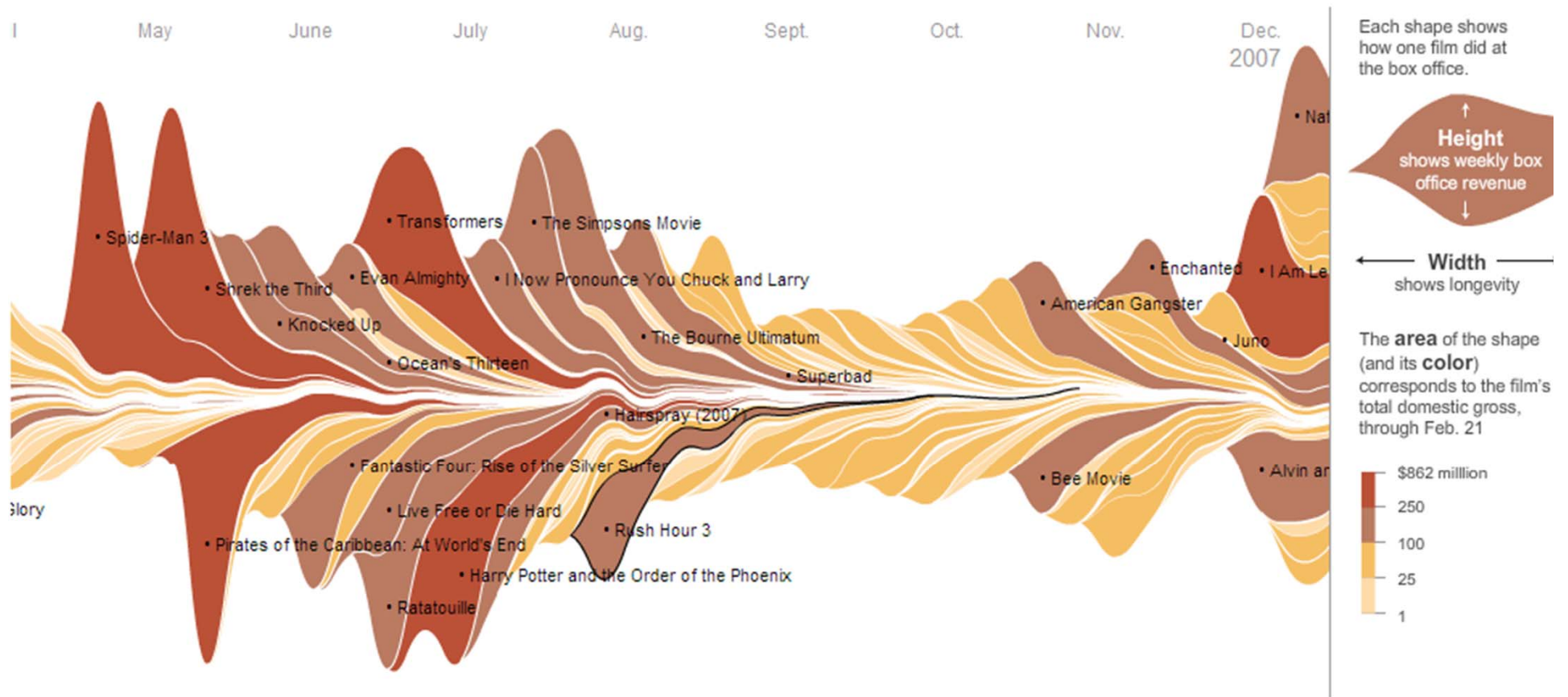


11/28/2012

36



Box Office Earnings



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

Let's get started...

Software

Processing

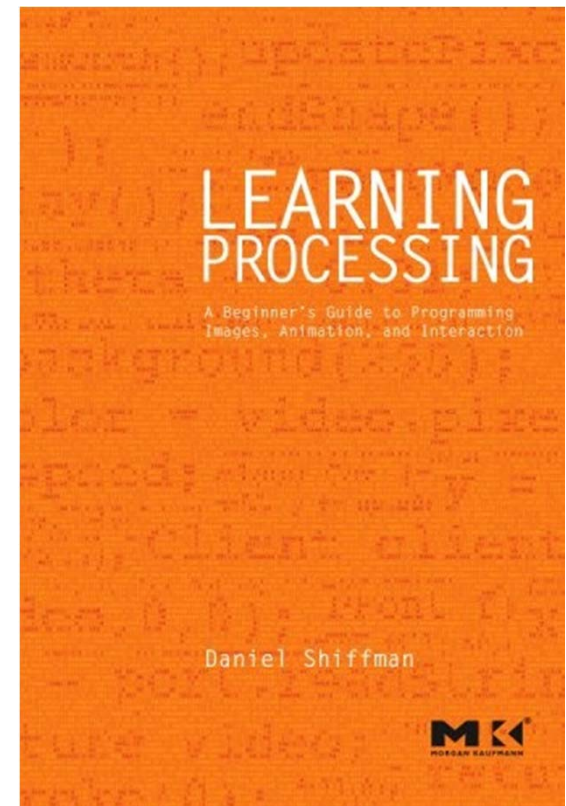
- Already installed in the CS Lab
- Also available for your own computer @ www.processing.org
- Processing == Java

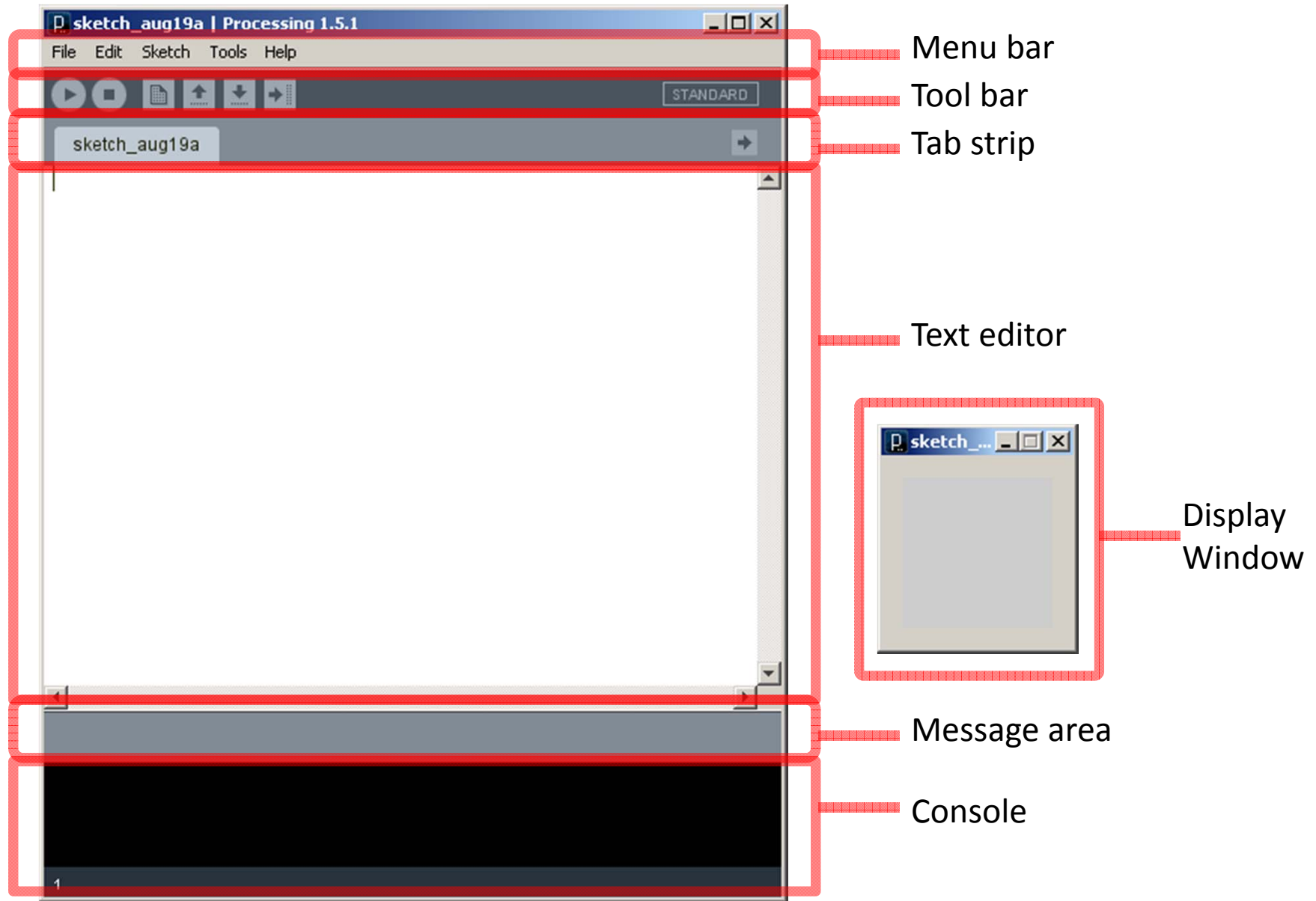


Book

Learning Processing: A Beginner's Guide to Programming Images, Animation, and Interaction by Daniel Schiffman, Morgan Kaufmann Publishers, 2008. Available at the Campus Bookstore.

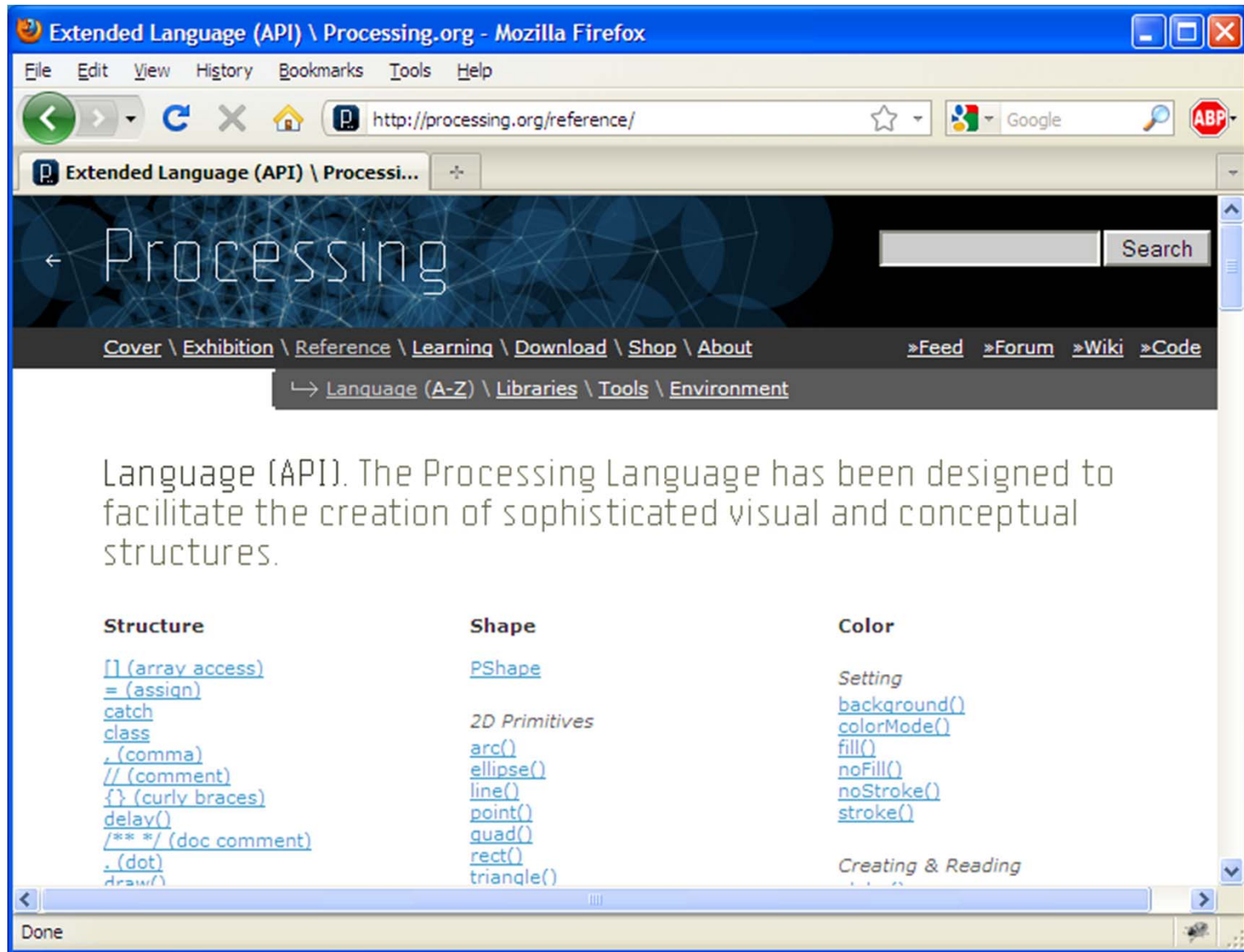
<http://www.learningprocessing.com/>





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

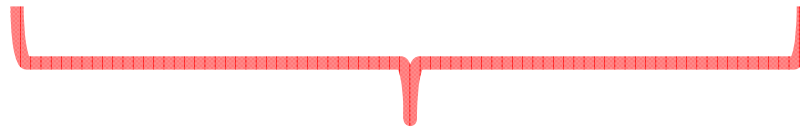
Function name

Parentheses

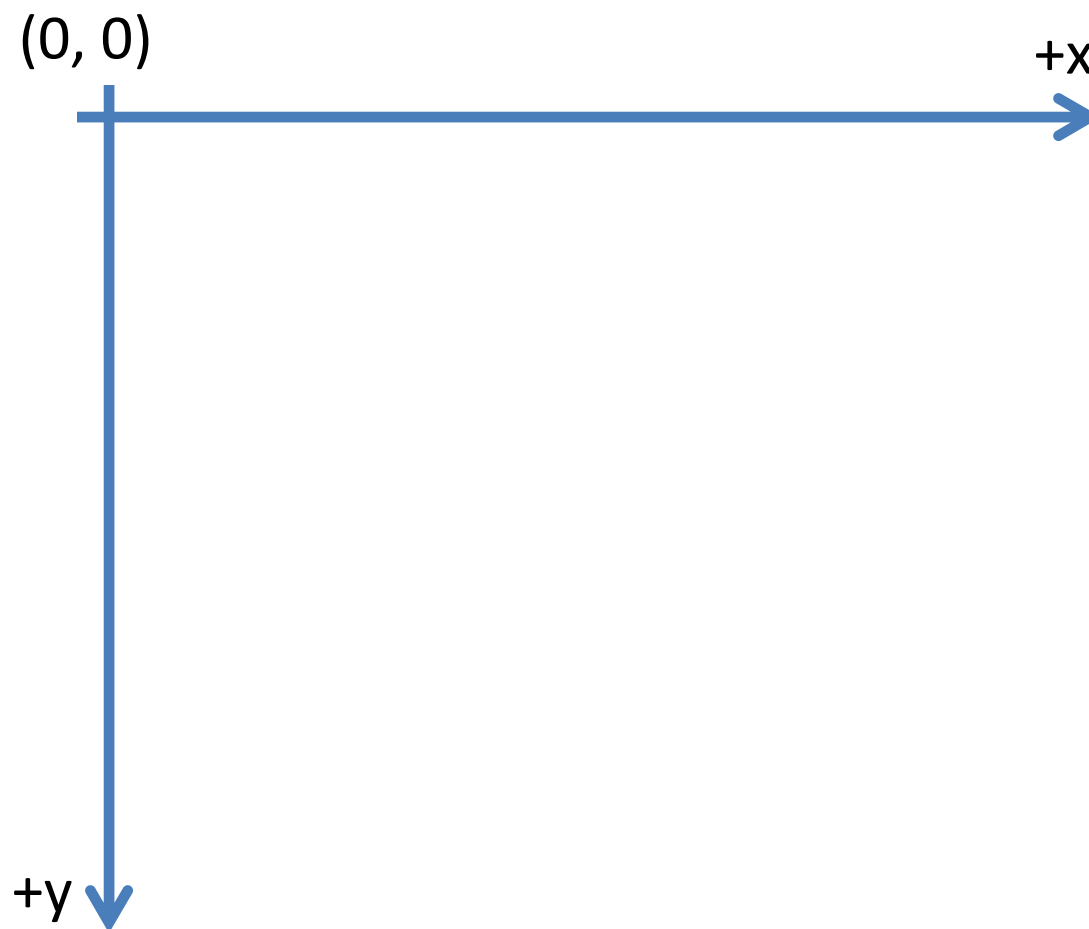
line(10, 10, 50, 80);

Arguments

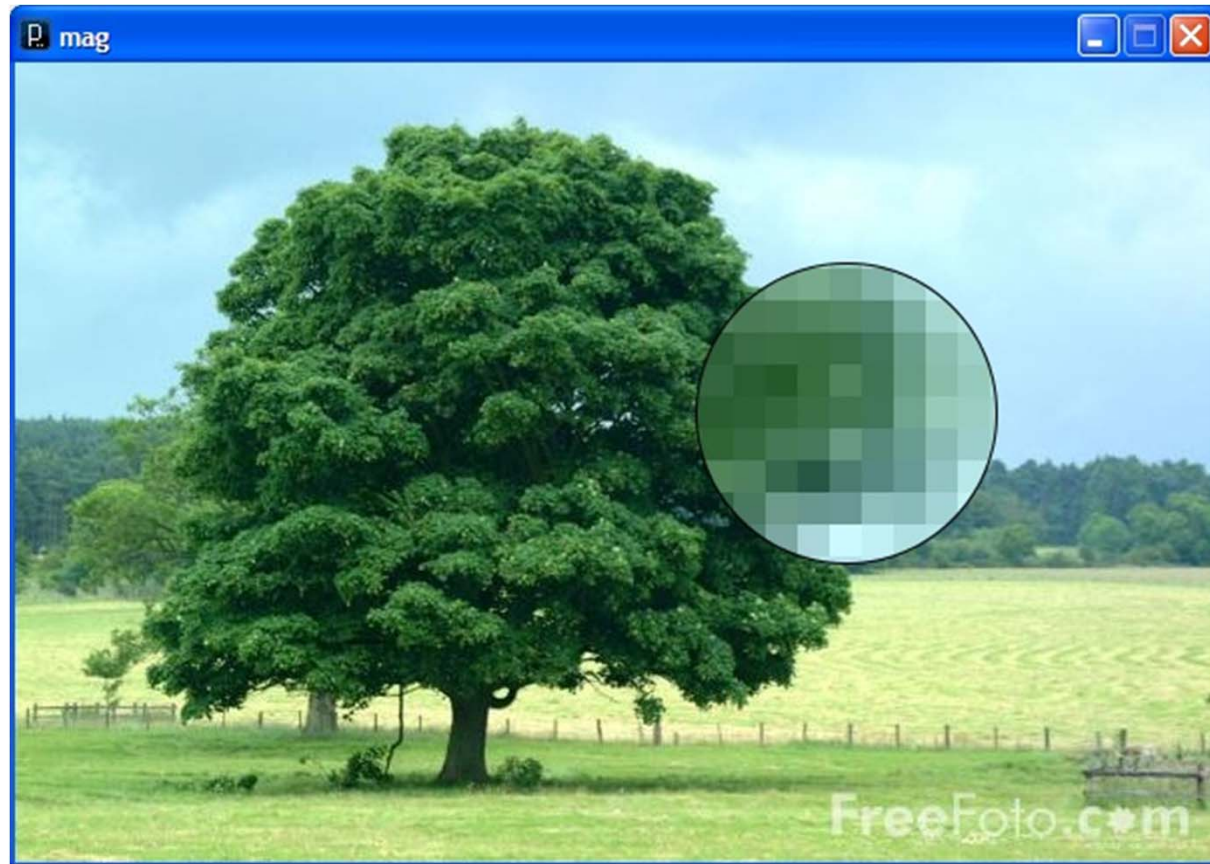
Statement terminator



Coordinate System



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 );
```

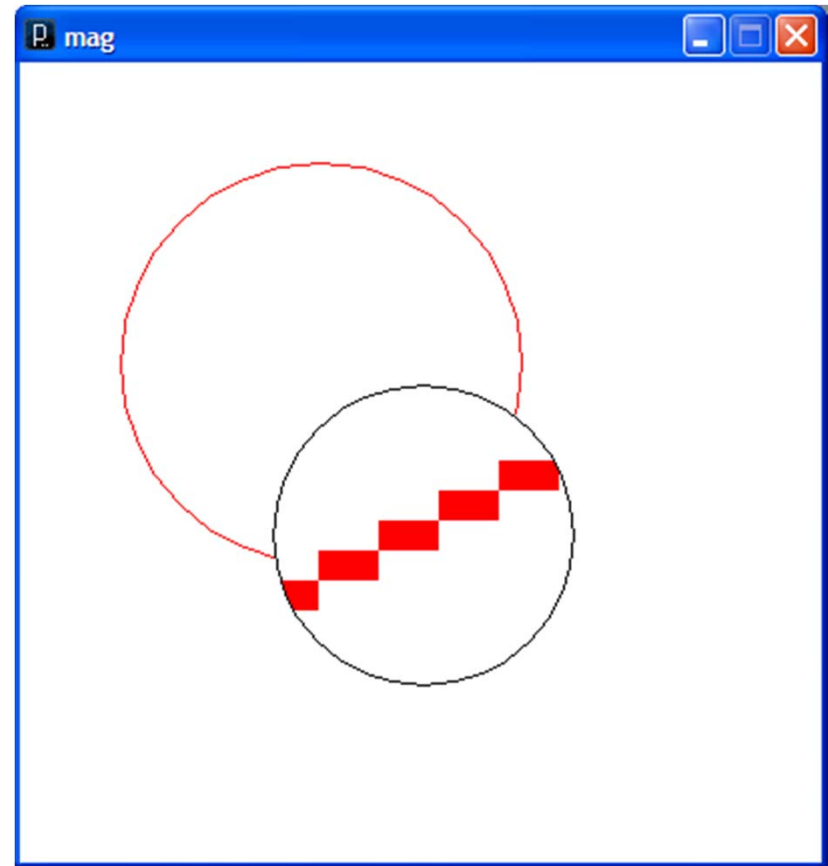
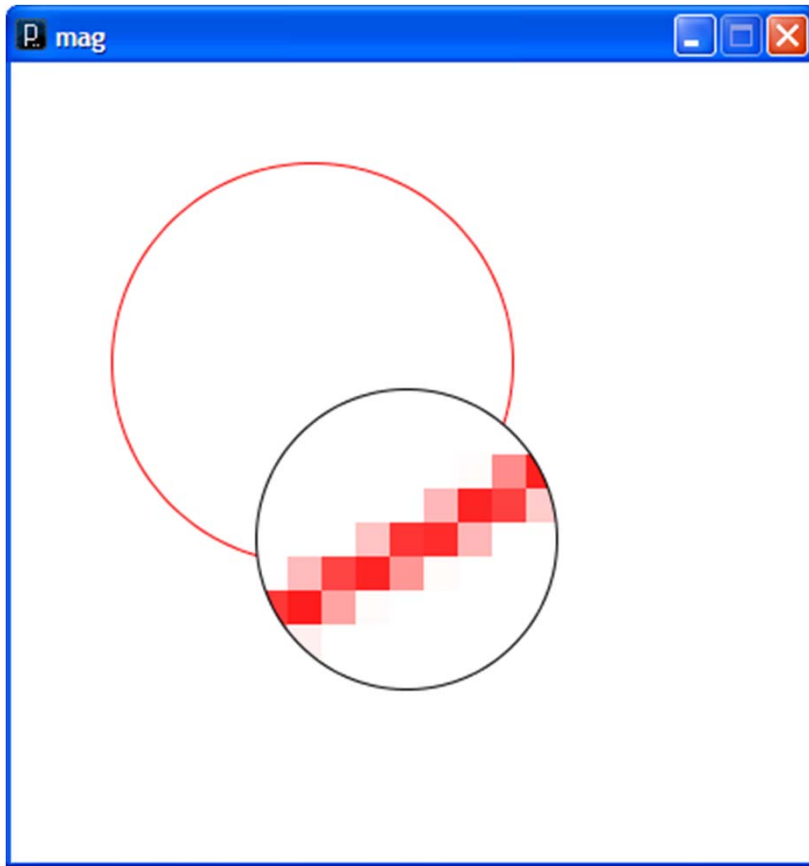
```
triangle( x1, y1, x2, y2, x3, y3 );
```

```
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

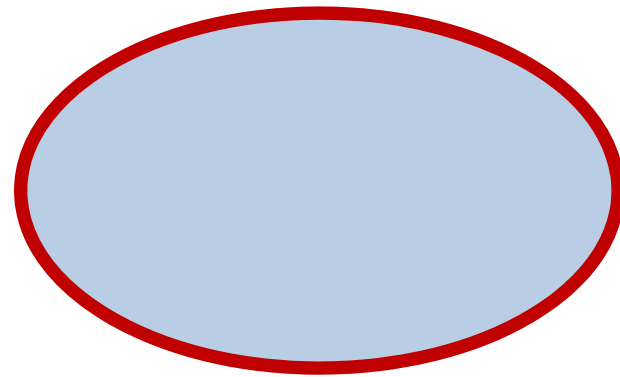
3. Blue

4. Alpha (Transparency)

Why 0 .. 255?

Shape Formatting

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



These are properties of your paintbrush, 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()

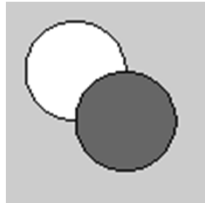


```
smooth();  
strokeWeight(1);    // Default  
line(20, 20, 80, 20);  
strokeWeight(4);    // Thicker  
line(20, 40, 80, 40);  
strokeWeight(10);   // Beastly  
line(20, 70, 80, 70);
```

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

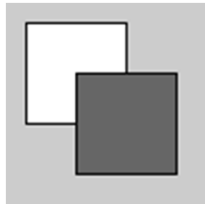
http://processing.org/reference/strokeWeight_.html

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);
```

