CMSC B110: Introduction to Computing

Spring 2012 – Section 1

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Lectures

Tues/Thurs 4-5:30 pm in Park 349

Labs

Tues/Thurs 5:30-6:30 pm in Park 231

Office Hours

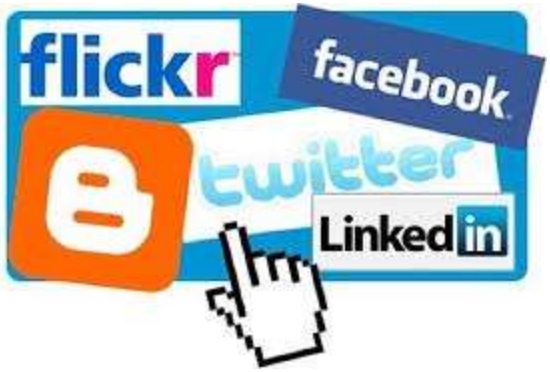
Tues/Thurs 1-4 pm by arrangement in Park 250

Grading

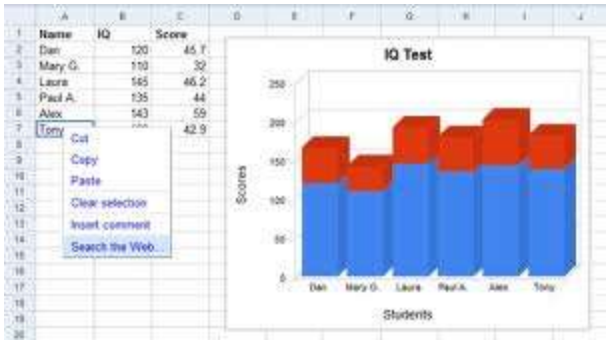
• 7 Assignments	42%
• 6 Problem Sets	18%
• Exam 1	20%
• Exam 2	20%
Total	100%

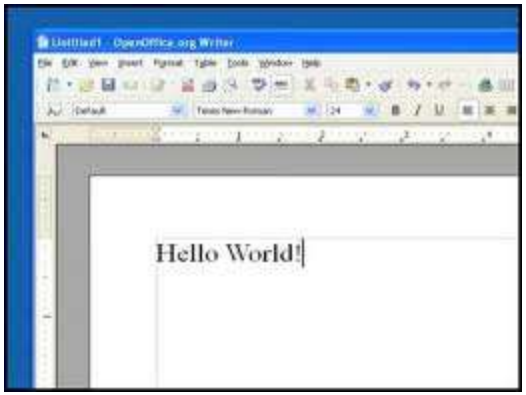
What is Computing?

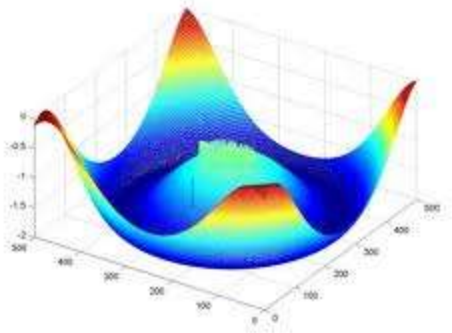
Computing: Web, e-mail, social…

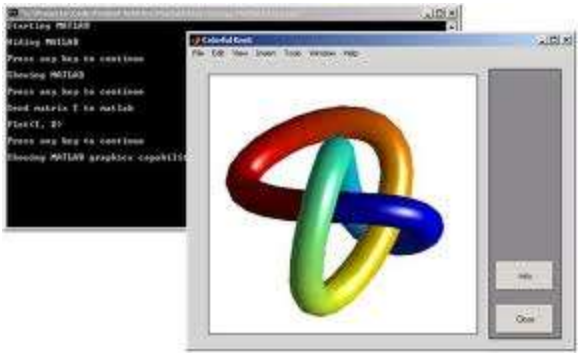


Computing: Productivity…



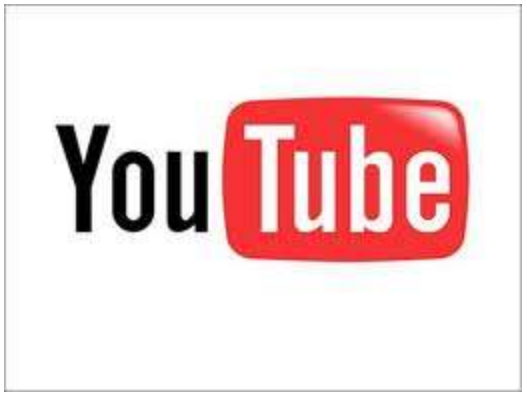


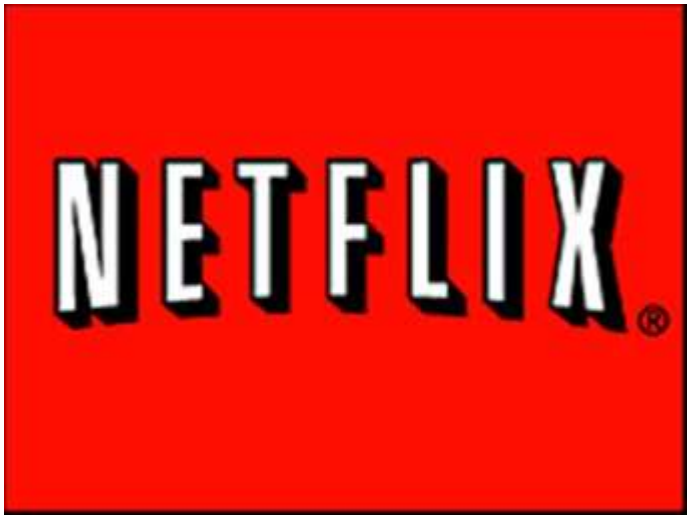




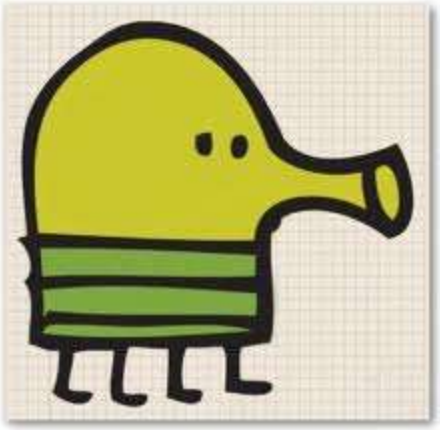
Computing: Digital Photography

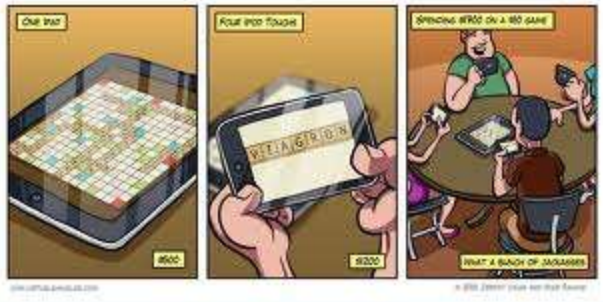
Computing: Entertainment…





Computing: Gaming…

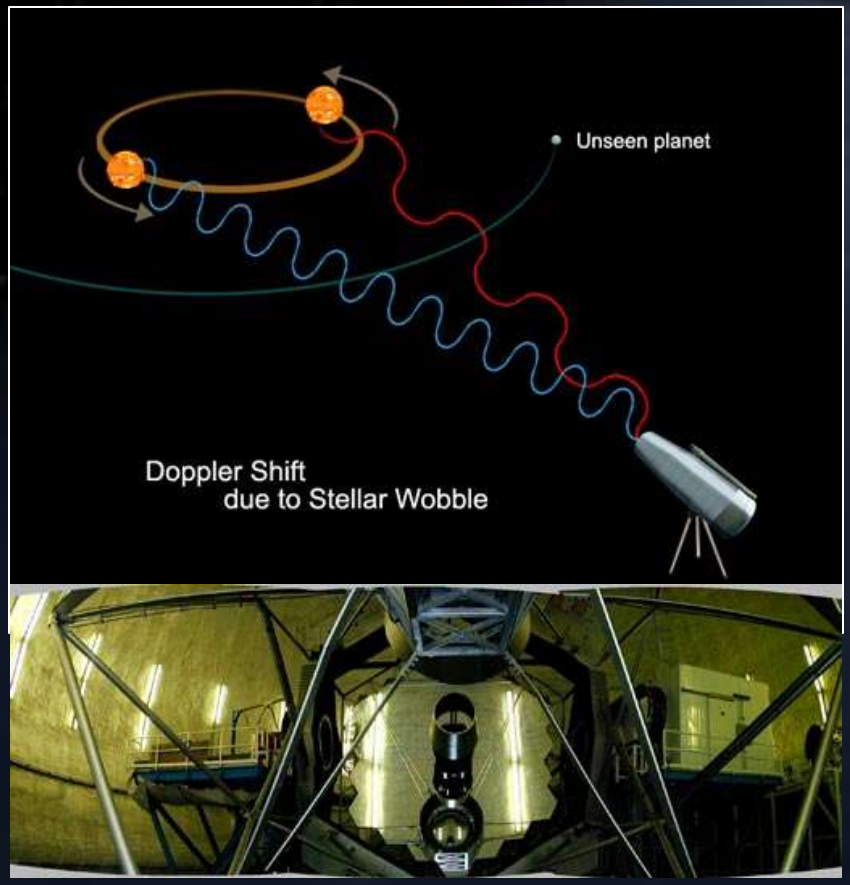


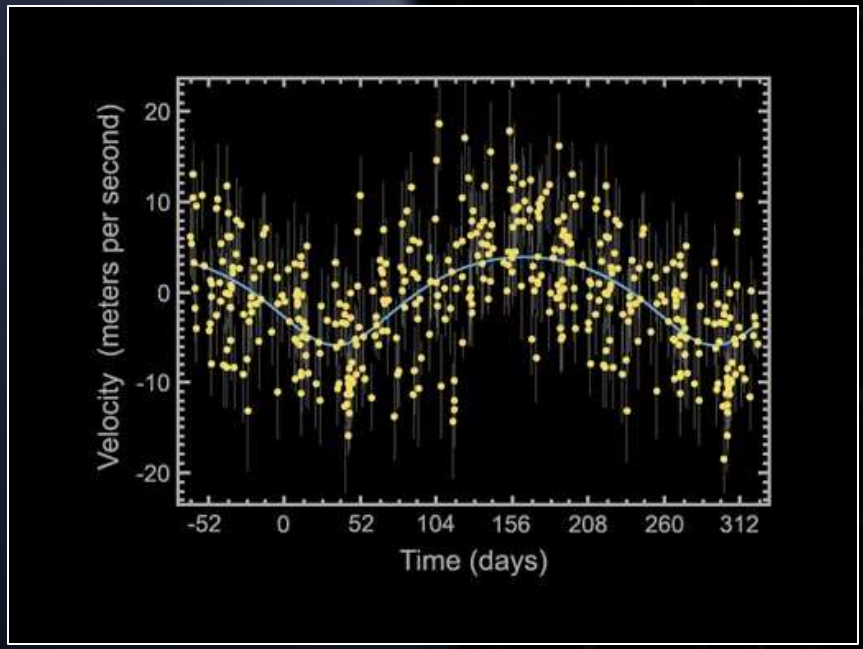


2011 Jeopardy!

- 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

Finding Life-Supporting Planets





ART

Protobytes
By Ira Greenberg

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** nucelotide sit next to each other.

Reading the ch

The outer ring r
Orange marks t
CpG methylatio

1 million base pairs

MUSCLE
LIVER
HEART
WHITE BLOOD CELL
SKIN
PLACENTA
SPERM

Chromosome 22

Of the 23 pairs of chromosomes in the human genome, 22 is the second smallest, containing only about 2

Gray and white bands on the circular chart correspond to

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

- Edsger Dijkstra

Computing is important.

Fastest Growing Occupations

Table 1.3 Fastest growing occupations, 2008 and projected 2018
(Numbers in thousands)

2008 National Employment Matrix title and code	Employment		Change, 2008-18		Median Annual wage quartile, 2008
	2008	2018	Number	Percent	
Network systems and data communications analysts	292.0	447.8	155.8	53.36	VH
Computer software engineers, applications	514.8	689.9	175.1	34.01	VH
Computer software engineers, systems software	394.8	515.0	120.2	30.44	VH

Source: Employment Projections Program, U.S. Department of Labor, U.S. Bureau of Labor Statistics

Occupational Outlook Handbook, 2010-11 Edition, http://www.bls.gov/emp/ep_table_103.htm

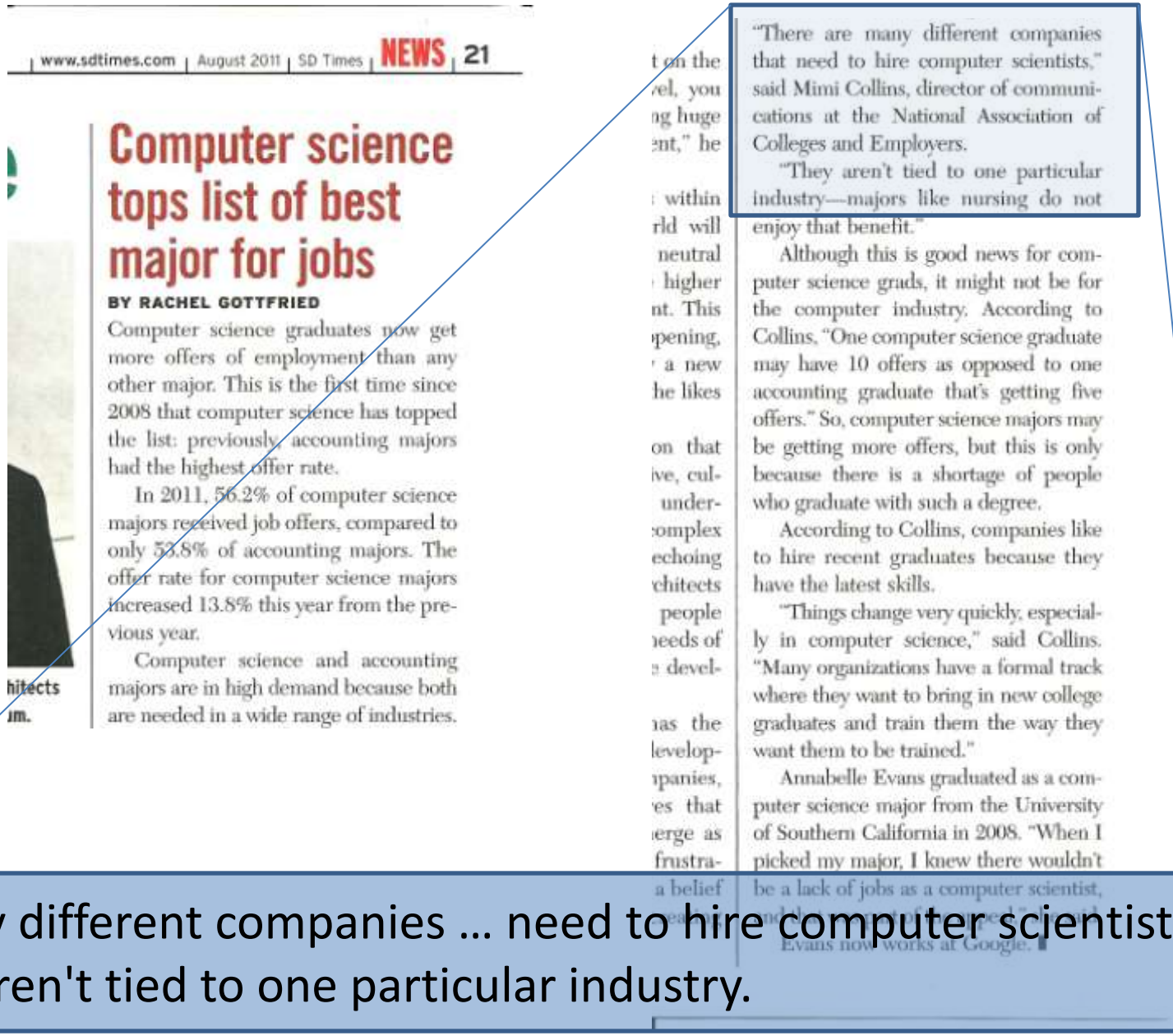
JANUARY 5, 2011

The Best and Worst Jobs

CareerCast rated 200 jobs based on income, working environment, stress, physical demands and job outlook, using data from the Labor Dept. and U.S. Census researchers' own expertise. See which jobs were ranked highest and lowest, and their midlevel income. The highest-ranked jobs are highlighted in yellow. **Click o headers to sort.** See full rankings on CareerCast.com. (More: The Best and Worst Jobs.)

Rank	Title	Midlevel Income
1	software engineer	$87,000
2	mathematician	$94,000
3	actuary	$87,000
4	statistician	$73,000
5	computer systems analyst	$77,000
6	meteorologist	$85,000
7	biologist	$74,000
8	historian	$63,000
9	audiologist	$63,000

http://online.wsj.com/public/resources/documents/st_BESTJOBS0104_20110105.html



www.sdtimes.com | August 2011 | SD Times | NEWS | 21

Computer science tops list of best major for jobs

BY RACHEL GOTTFRIED

Computer science graduates now get more offers of employment than any other major. This is the first time since 2008 that computer science has topped the list: previously, accounting majors had the highest offer rate.

In 2011, 56.2% of computer science majors received job offers, compared to only 53.8% of accounting majors. The offer rate for computer science majors increased 13.8% this year from the previous year.

Computer science and accounting majors are in high demand because both are needed in a wide range of industries.

"There are many different companies that need to hire computer scientists," said Mimi Collins, director of communications at the National Association of Colleges and Employers.

"They aren't tied to one particular industry—majors like nursing do not enjoy that benefit."

Although this is good news for computer science grads, it might not be for the computer industry. According to Collins, "One computer science graduate may have 10 offers as opposed to one accounting graduate that's getting five offers." So, computer science majors may be getting more offers, but this is only because there is a shortage of people who graduate with such a degree.

According to Collins, companies like to hire recent graduates because they have the latest skills.

"Things change very quickly, especially in computer science," said Collins. "Many organizations have a formal track where they want to bring in new college graduates and train them the way they want them to be trained."

Annabelle Evans graduated as a computer science major from the University of Southern California in 2008. "When I picked my major, I knew there wouldn't be a lack of jobs as a computer scientist,

Evans now works at Google.

…many different companies … need to hire computer scientists. They aren't tied to one particular industry.

How many of us are studying CS?

United States and Canada

Figure 7. Newly Declared CS/CE Undergraduate Majors

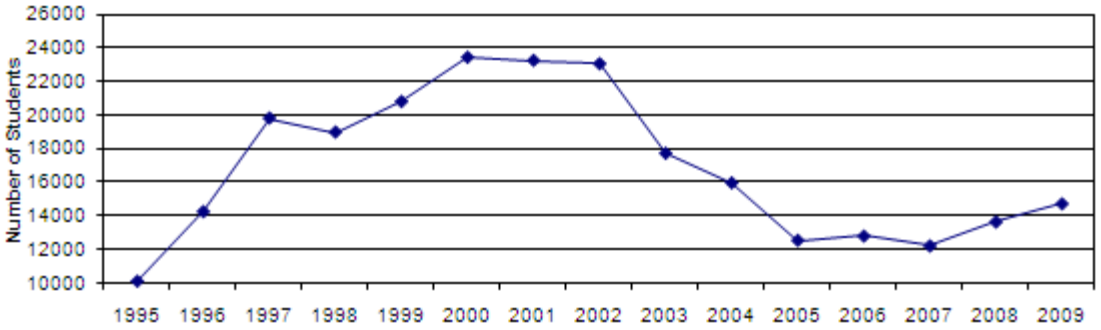
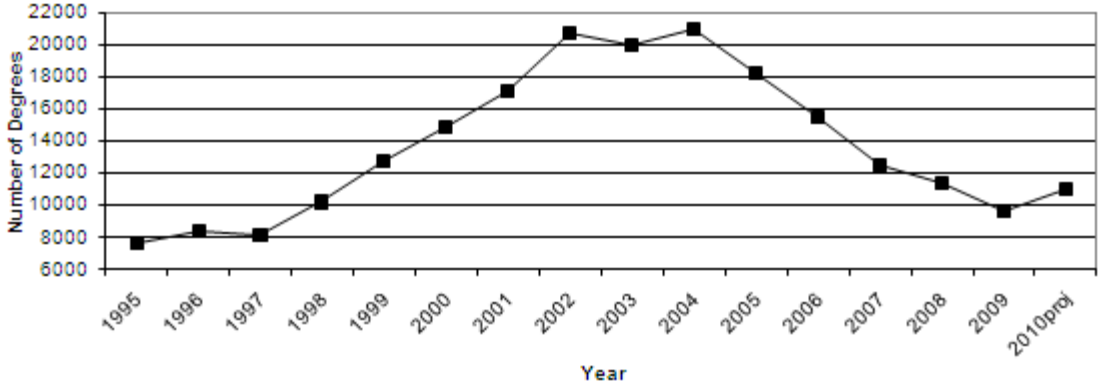


Figure 6. BS Production (CS & CE)



Computing Research News, CRA May 2010
http://www.cra.org/resources/taulbee/

CS=Computer Science, CE=Computer Engineering

Secondary Schools

TABLE 1

Secondary schools offering introductory (or pre-AP) Computer Science courses, change from 2005 baseline

	2007	2009
Yes	-6%	-17%

Secondary offering AP Computer Science courses, change from 2005 baseline

	2007	2009
Yes	-20%	-35%

► *Source: Computer Science Teachers Association survery data of high schools*

Running On Empty: The Failure to Teach K–12 Computer Science in the Digital Age
http://www.acm.org/runningonempty/

We've turned a corner…

- "Stanford University enrollment for in CS106A (CS1) [in 2010/2011] is 1087, which represents a year-on-year growth of 51%"
- Why?
  1. I'm just curious
  2. Increase my potential to land a good job
  3. I love computing
  4. Need to fill a requirement
  5. Other…

http://computinged.wordpress.com/2011/04/13/guest-post-eric-roberts-on-the-dangers-of-escalating-enrollments/

What can be programmed?


AT&T 3G
9:42 AM
SMS
Text
Tuesday
9
Calendar
Photos
Camera
YouTube
Stocks
280
Maps
73°
Weather
Clock
Calculator
Notes
Settings
iTunes
App Store
Phone
Mail
Safari
iPod

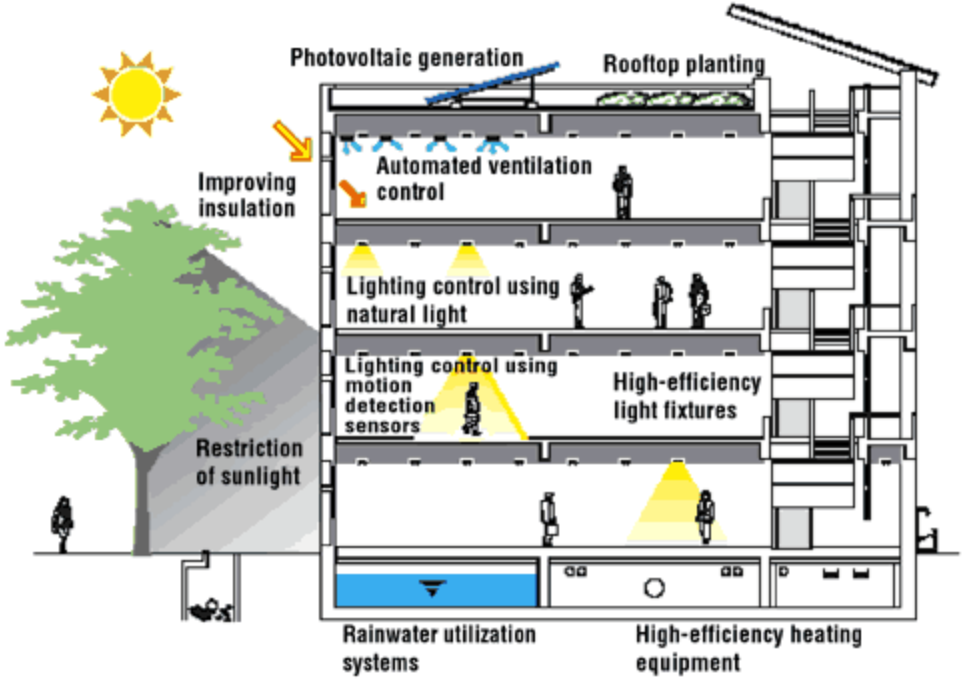

Start
Wednesday
September 05, 2007
11:59 AM
100%
19.11MB
75.46MB
PAQ Wireless
Outlook E-mail: 7 Unread
Review Proposal
12:00PM-1:00PM (Dave's office)
1 Active task
1 High priority
Device unlocked
Calendar
Contacts


Google
3:29 PM
Contacts
Browser
Contacts
Dialer
Dev Tools
Dialer
Maps
All

http://www.videophoneinsider.com/video-phone-history/

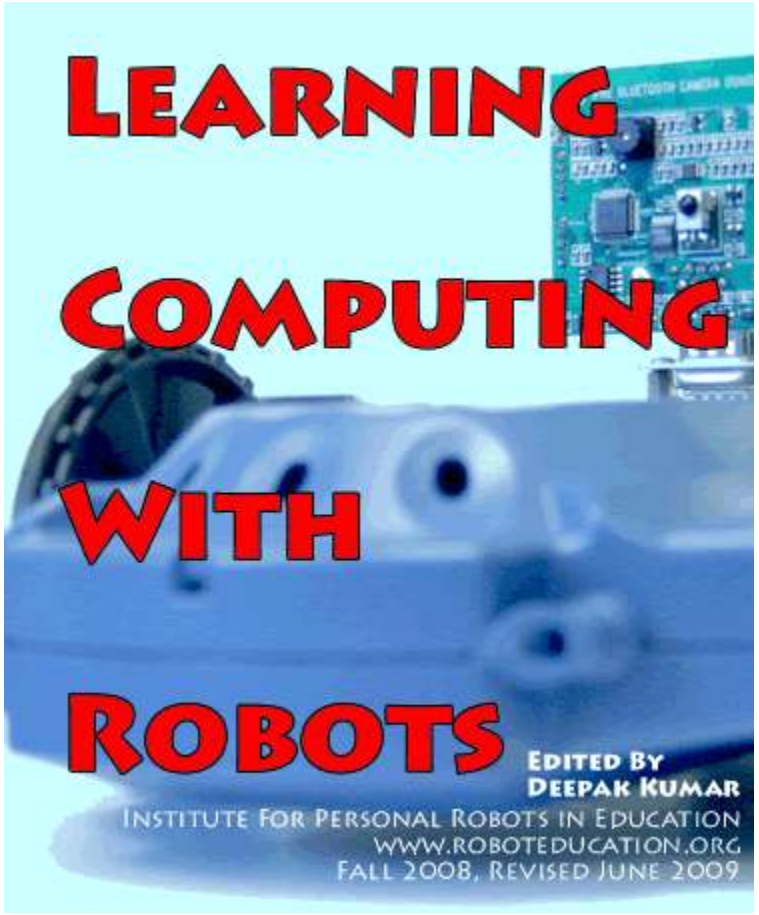
Google's Autonomous Car

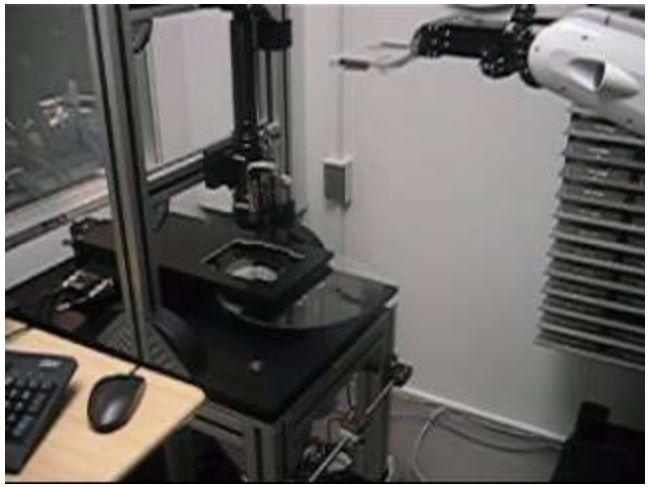
- Nevada made it legal for autonomous cars to drive on roads in June 2011

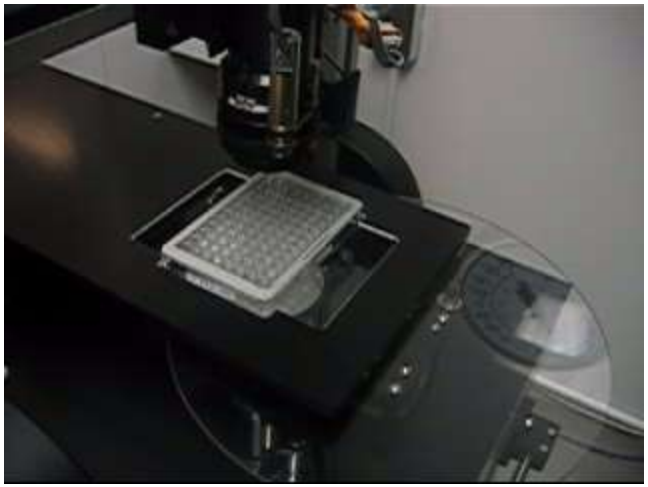


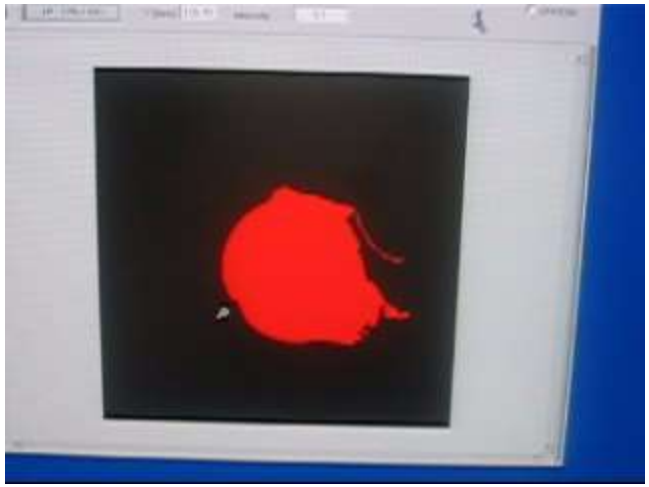
Conceptual Drawing of Green Building


LEARNING
COMPUTIN
ipre
roboteducation.org


LEARNING
COMPUTING
WITH
ROBOTS
EDITED BY
DEEPAK KUMAR
INSTITUTE FOR PERSONAL ROBOTS IN EDUCATION
WWW.ROBOTEDUCATION.ORG
FALL 2008, REVISED JUNE 2009







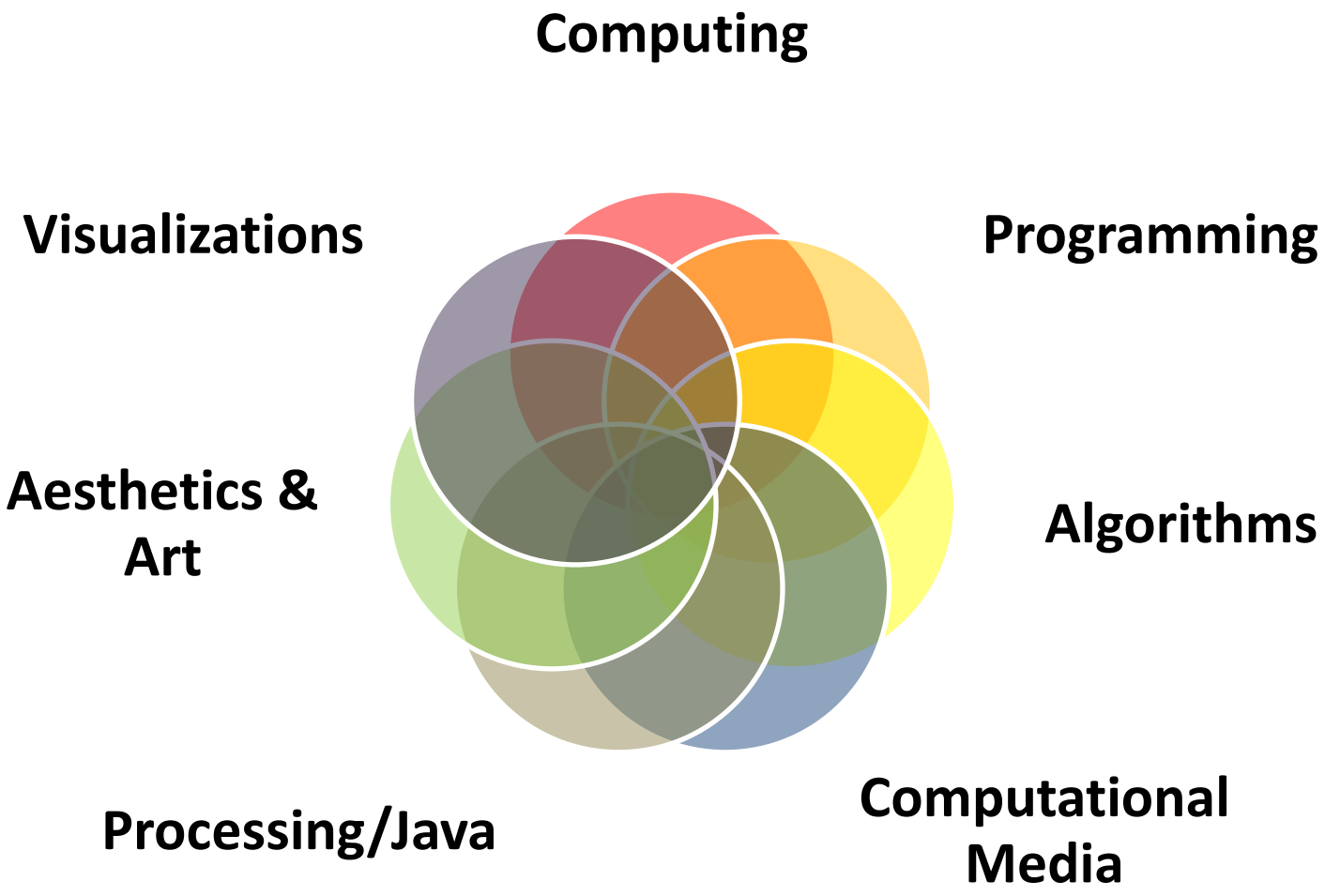
How do you program?

What is a Computer Program?

A collection of human and machine readable statements that can be translated to instructions executable by a computing device.

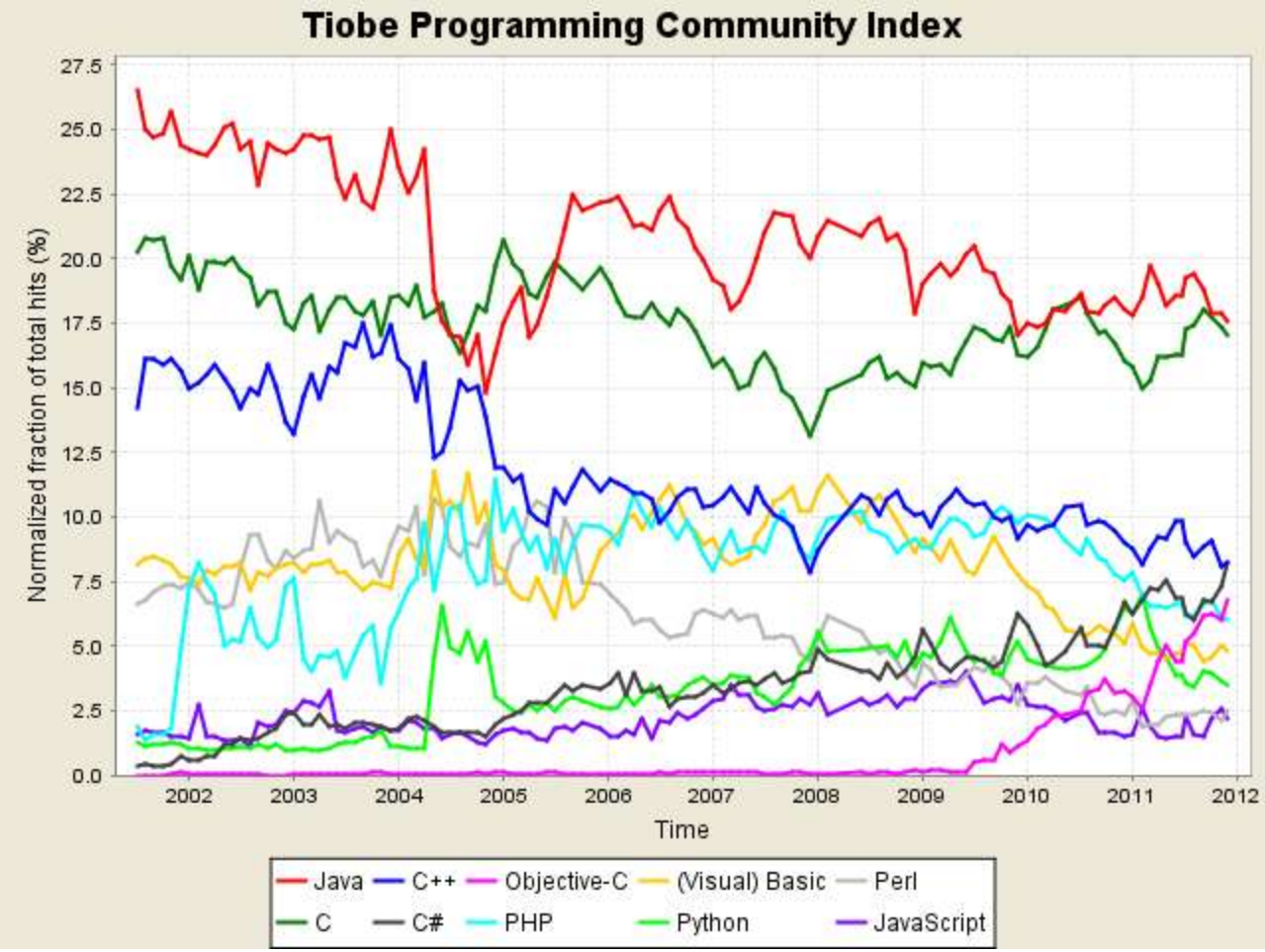
A text file.

Introduction to ^ Creative Computing



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!



http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html

Software

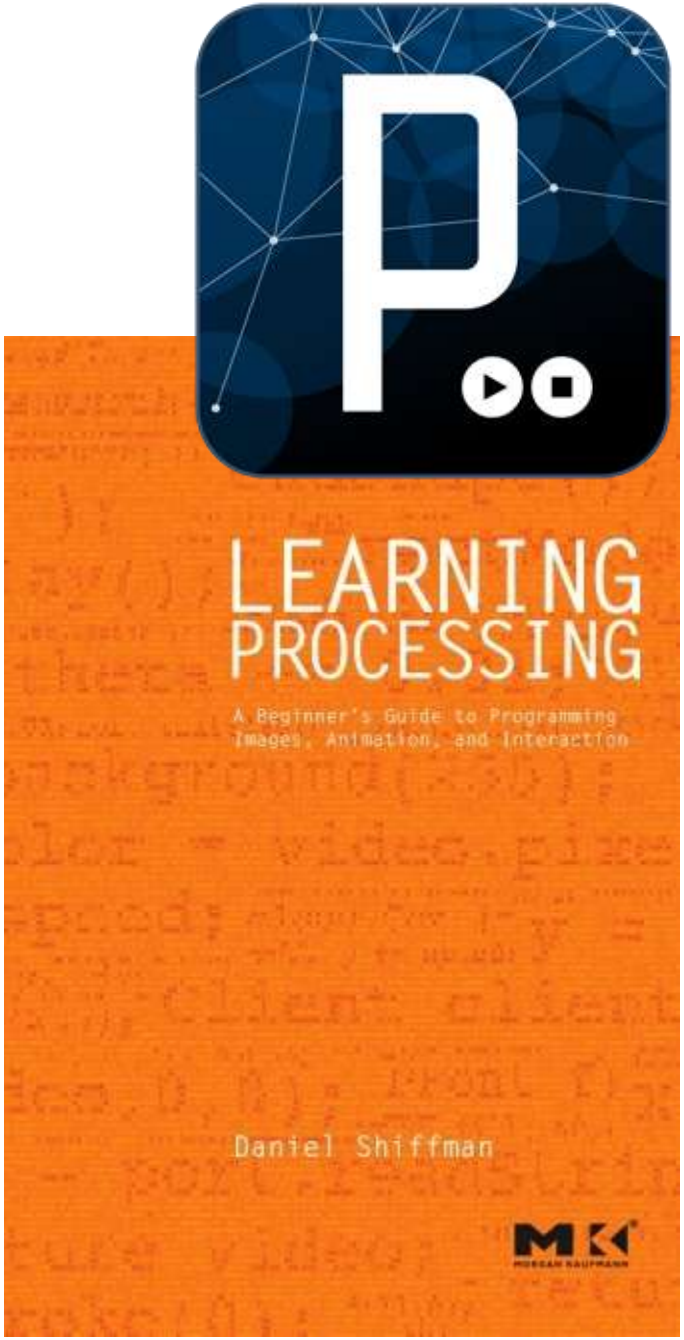
Processing

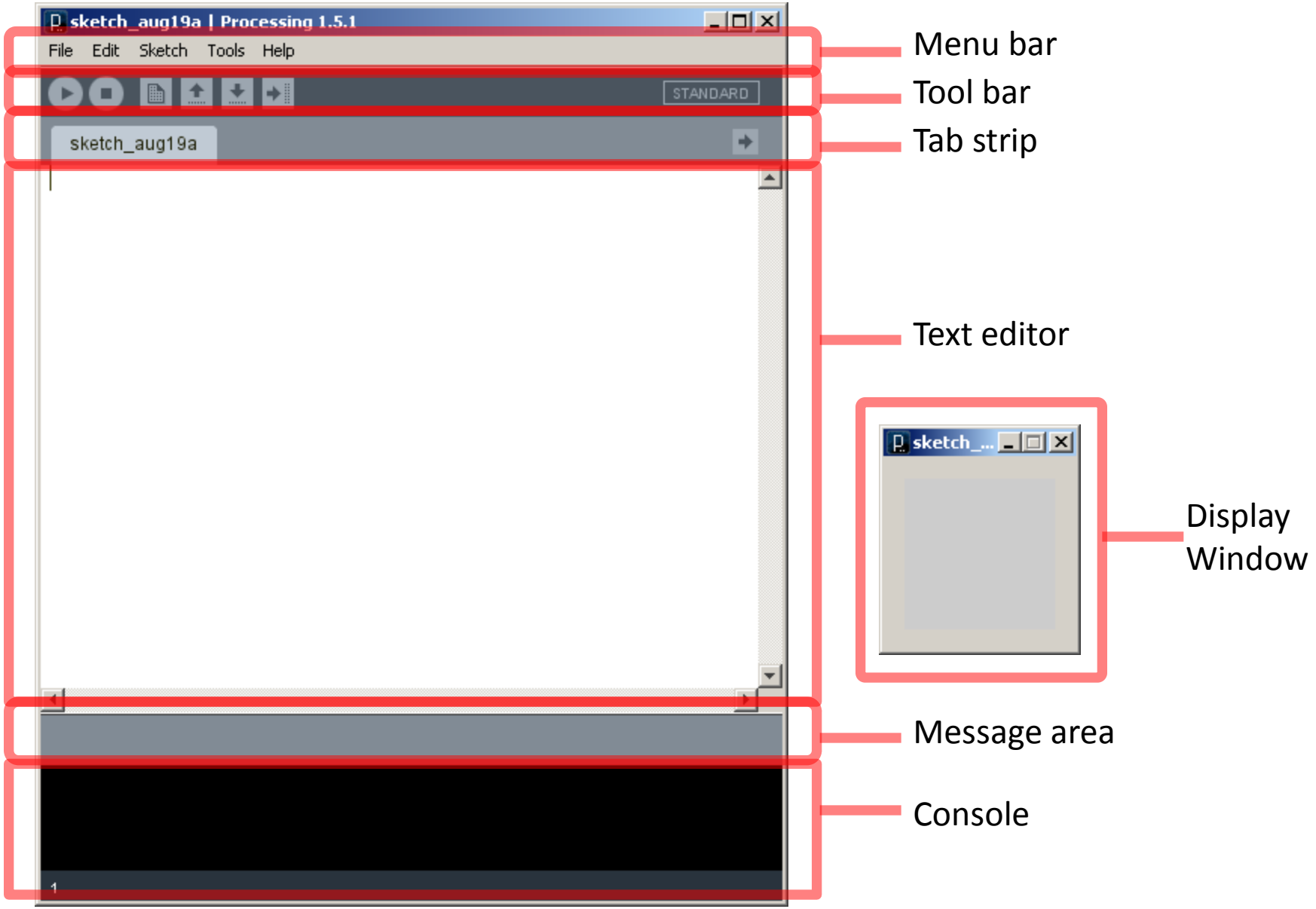
- Already installed in the CS Lab
- Also available for your own computer @ www.processing.org
- Processing == Java

Book

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

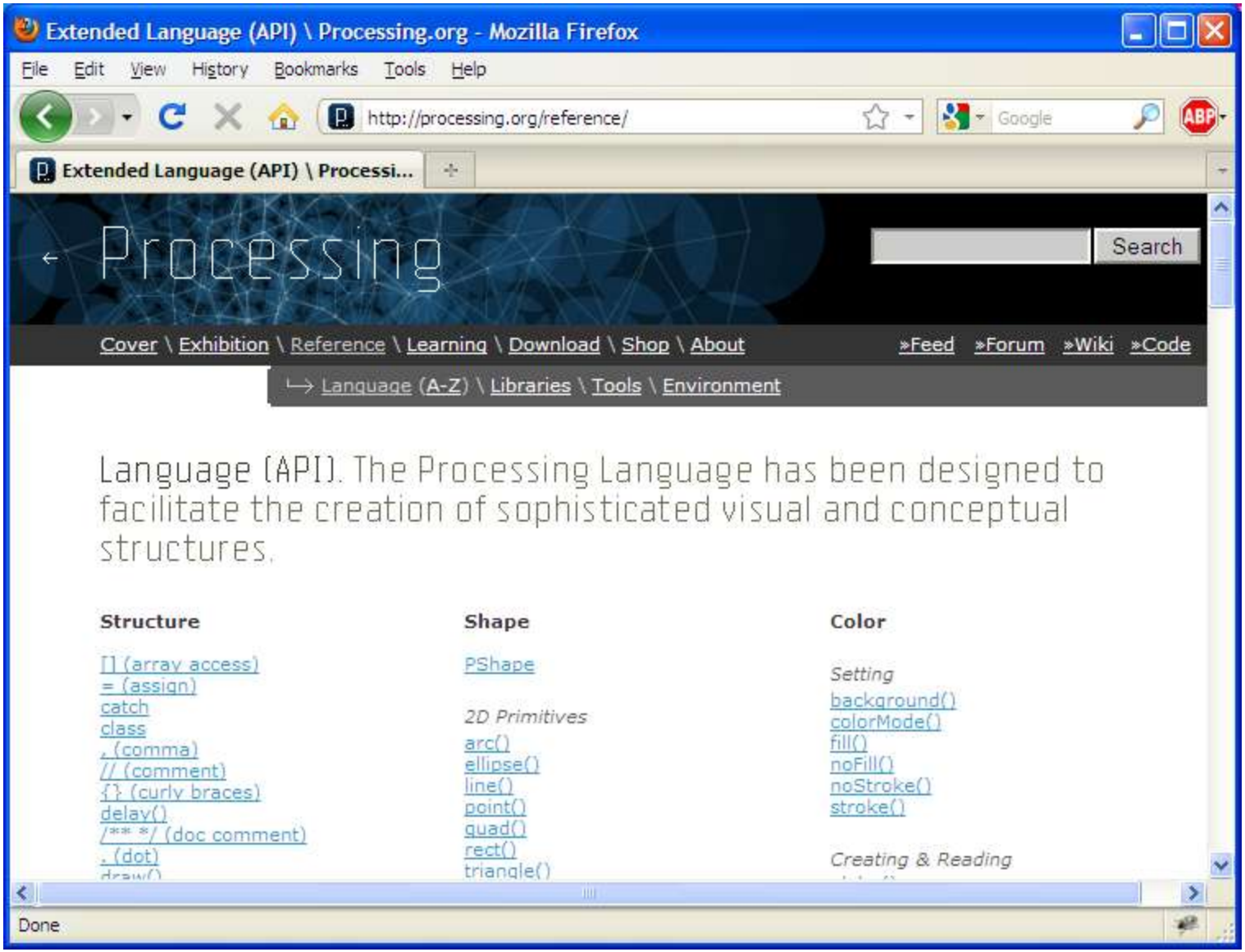
http://www.learningprocessing.com/




sketch_aug19a | Processing 1.5.1
File Edit Sketch Tools Help
STANDARD
sketch_aug19a
sketch_...
Menu bar
Tool bar
Tab strip
Text editor
Display Window
Message area
Console

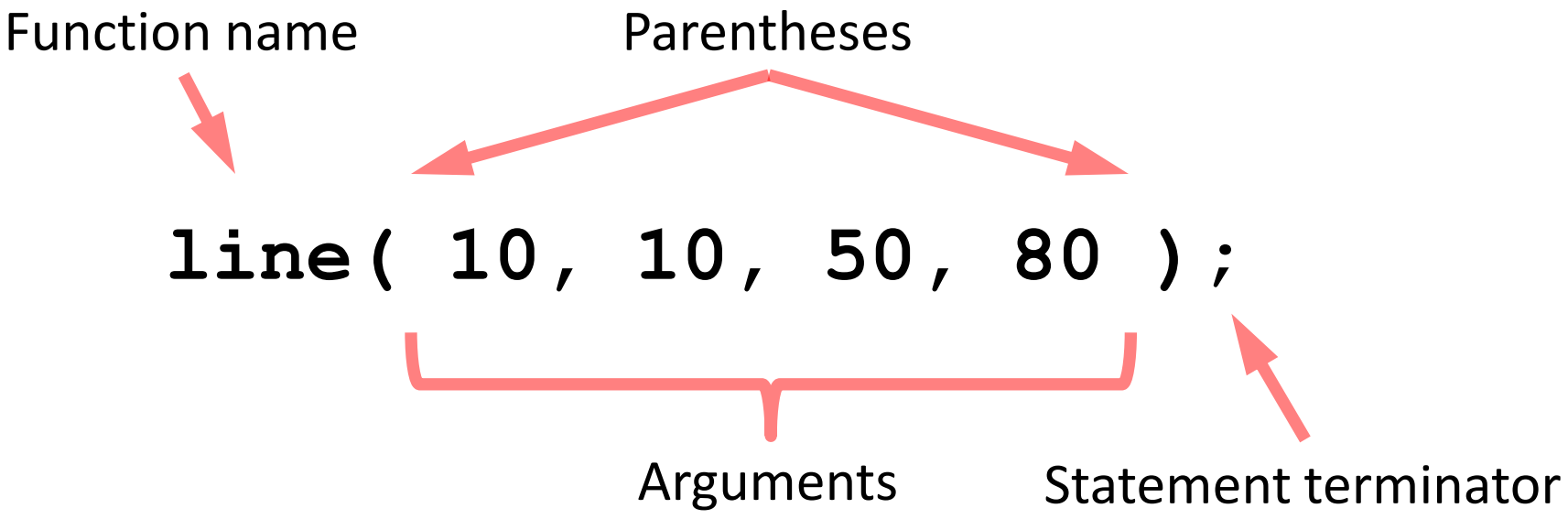
Primitive 2D Shapes

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

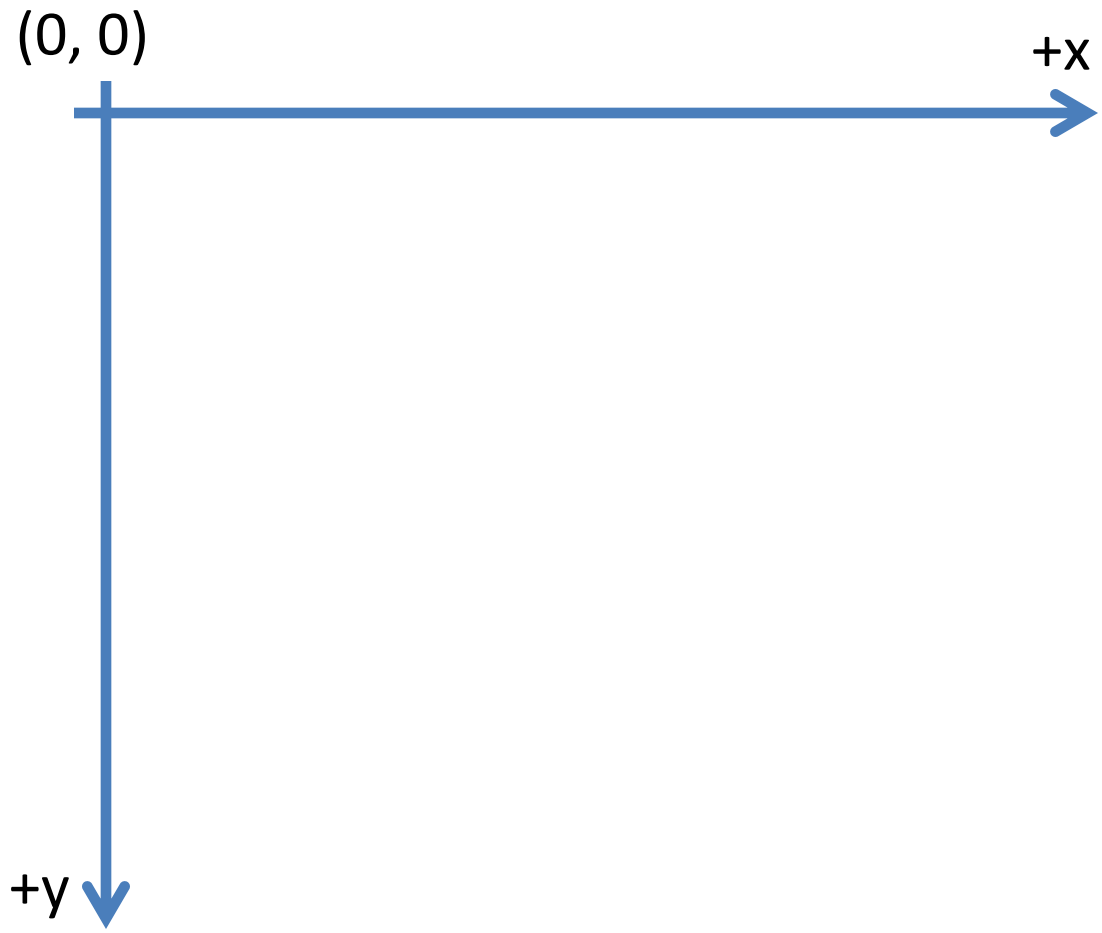


http://processing.org/reference/

Anatomy of a Function Call

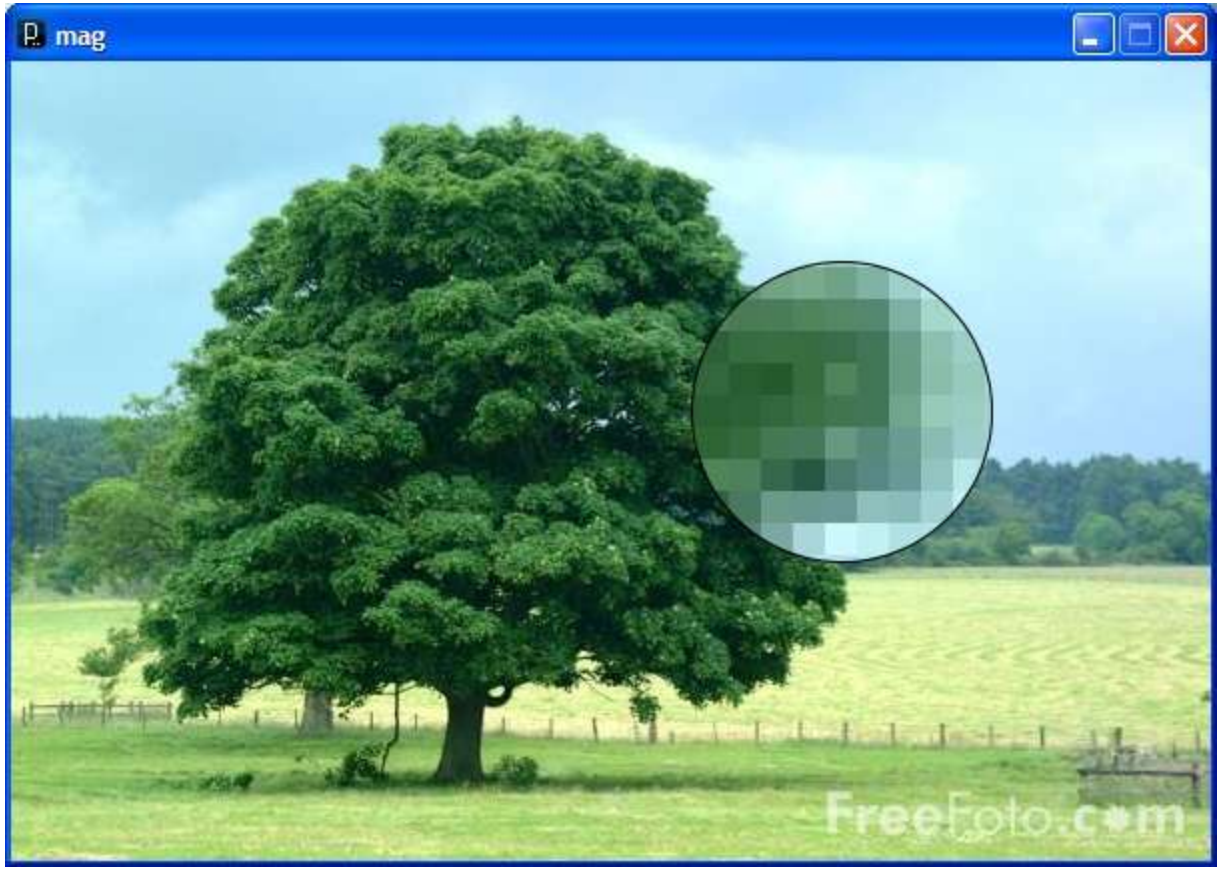


Coordinate System



coords.pde

Pixels



mag.pde

Processing Canvas

`size(` *`width, height`* **`);`**

Set the size of the canvas.

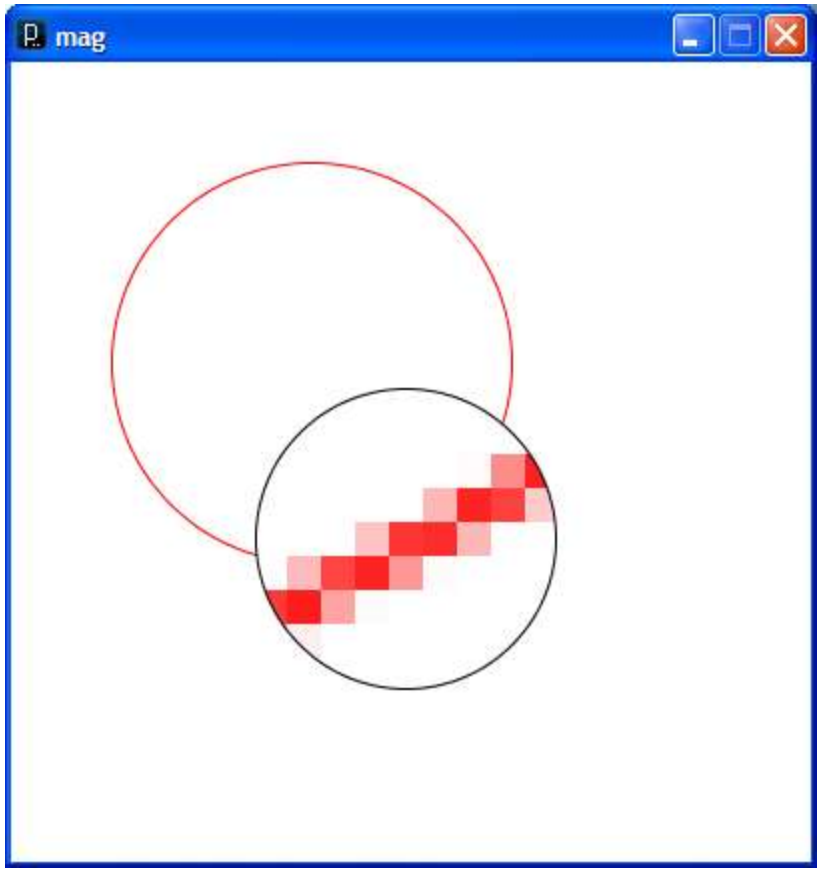
`background(` *`[0..255]`* **`);`**

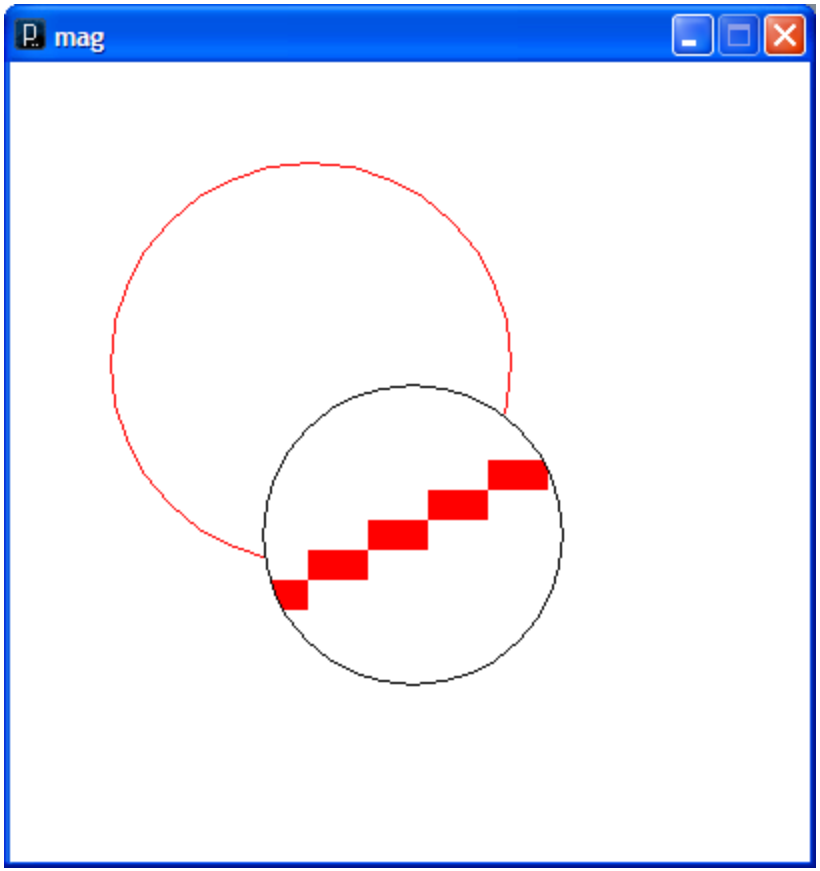
Set the background grayscale color.

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:

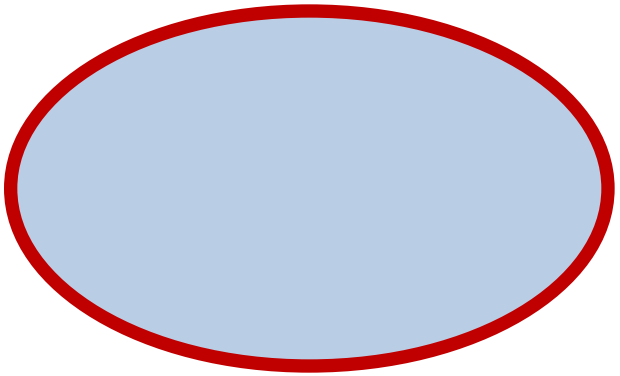
1. Red
2. Green
3. Blue
4. Alpha (Transparency)

rgba.pde

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()

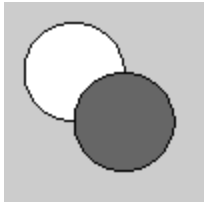
```
smooth();
strokeWeight(12.0);
strokeCap(ROUND);
line(20, 30, 80, 30);
strokeCap(SQUARE);
line(20, 50, 80, 50);
strokeCap(PROJECT);
line(20, 70, 80, 70);
```

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);
```

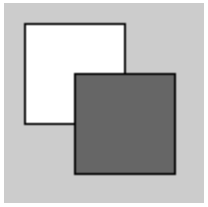
http://processing.org/reference/strokeCap_.html
http://processing.org/reference/strokeWeight_.html

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);
```

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

Dropbox

- https://www.dropbox.com/

Processing.JS

- A Javascript implementation of Processing
- Runs in any modern web browser
  - Does not run well in IE8 and under
- Most of Processing is implemented
  - Images are processed slowly
  - No file IO
- http://processing**js**.org

Studio Sketchpad

- Collaboratively edit, run and chat about a Processing.js program

- http://sketchpad.cc
- http://studio.sketchpad.cc