

CMSC 110  
Introduction to Computing  
Section 2  
  
Dianna Xu

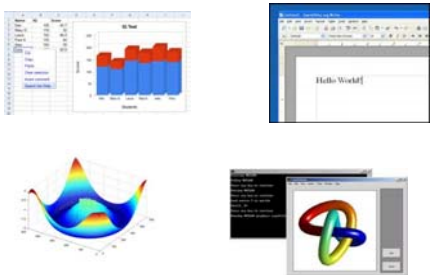
What is Computing?

Computing: Web, e-mail, social...



The illustration shows a person surfing on blue waves. The background is a blue sky with white clouds and faint text like 'WWW', 'INTERNET', and 'NETWORK'. To the right is a large 3D '@' symbol. Below it are logos for flickr, facebook, e, twitter, and LinkedIn, with a hand cursor pointing at the 'e' logo.

Computing: Productivity...



The image shows four productivity-related screenshots: a spreadsheet with a bar chart, a presentation slide with the text 'Hello World!', a 3D surface plot with a rainbow color gradient, and a 3D modeling software window showing a colorful knot-like structure.

Computing: Digital Photography

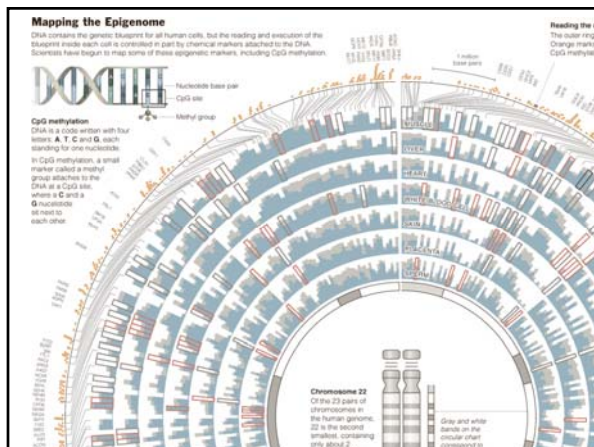
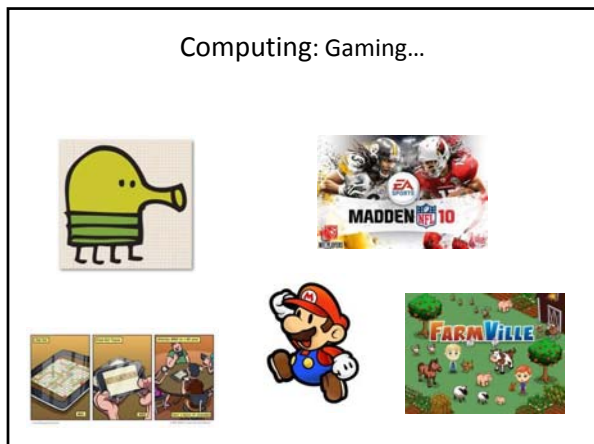


A photograph of a vibrant rainbow arching over a dark blue ocean with white-capped waves in the foreground.

Computing: Entertainment...



The image features several entertainment-related logos and icons: a smartphone home screen with various app icons, the YouTube logo, a silhouette of a person dancing, the Hulu logo, and the Netflix logo.



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](http://www.bls.gov/emp/ep_table_103.htm)

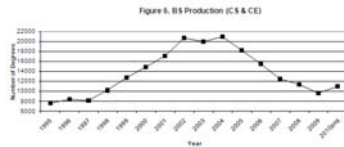
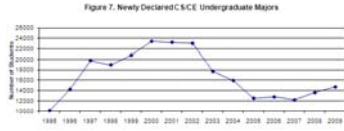
**The Best and Worst Jobs**

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 median income. The highest-ranked jobs are highlighted in yellow. Click a header to sort. See full rankings on CareerCast.com. (More: The Best and Worst Jobs.)

Rank	Title	Median Income
1	software engineer	\$87,000
2	mathematician	\$84,000
3	actuary	\$83,000
4	statistician	\$75,000
5	computer systems analyst	\$77,000
6	meteorologist	\$65,000
7	biologist	\$74,000
8	restoran	\$63,000
9	audiologist	\$65,000

[http://online.wsj.com/public/resources/documents/st\\_BESTJOBS0104\\_20110105.html](http://online.wsj.com/public/resources/documents/st_BESTJOBS0104_20110105.html)

## How many of us are studying CS? United States and Canada



Computing Research News, CRA May 2010 CS=Computer Science, CE=Computer Engineering  
<http://www.cra.org/resources/taulbee/>

## 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 survey data of high schools

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

What can be programmed?



### Autonomous Driving

Google's modified Toyota Prius uses an array of sensors to navigate public roads without a human driver. Other components, not shown, include a GPS receiver and an inertial motion sensor.

#### LiDAR

A rotating sensor on the roof scans more than 300 feet in all directions to generate a precise three-dimensional map of the car's surroundings.

#### POSITION ESTIMATOR

A sensor mounted on the left rear wheel measures small movements made by the car and helps to accurately locate its position on the map.

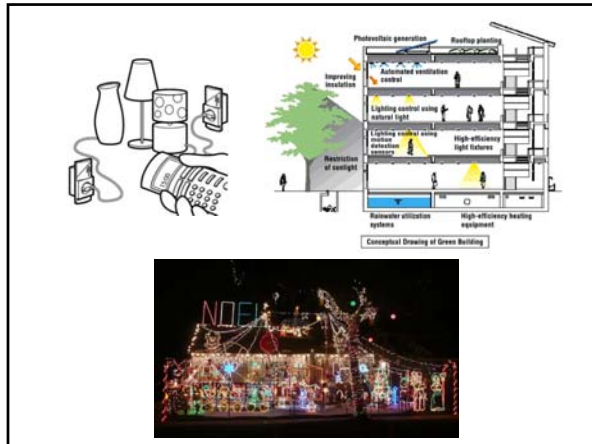
#### VIDEO CAMERA

A camera mounted near the rear-view mirror detects traffic lights and helps the car's onboard computers recognize moving obstacles like pedestrians and bicyclists.

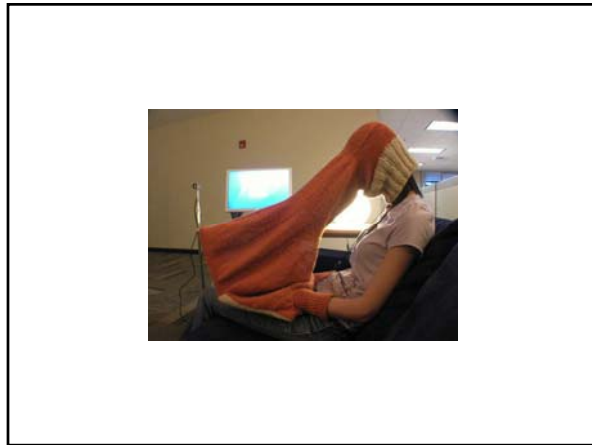
#### RADAR

Four standard automotive radar sensors, three in front and one in the rear, help determine the positions of distant objects.



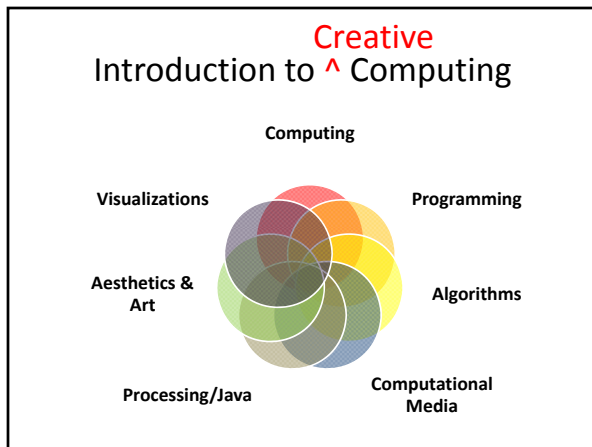


How do you program?



What is a Computer Program?

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



**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!

# Why?



# Examples

Shepard Fairey



# Obamicons



## 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

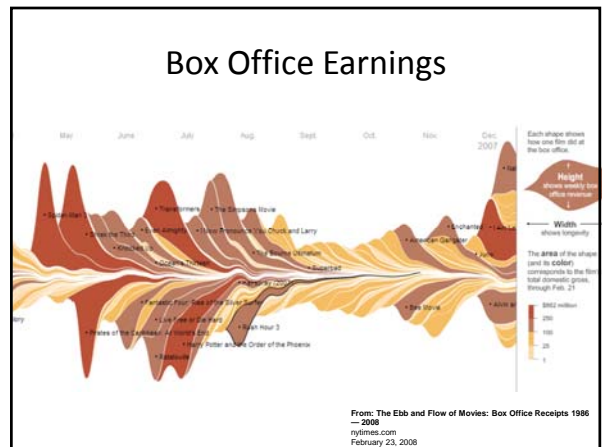
Your daddy's rich  
And your mamma's good lookin'  
So hush little baby  
Don't you cry

Lyrics by George Gershwin

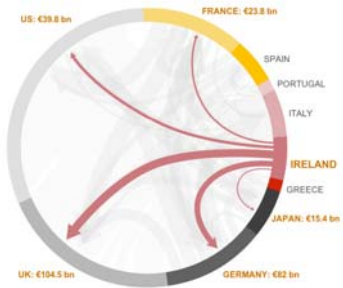
## Word Cloud

rise  
mamma easy  
cry livin cotton little hush  
morning daddy baby lookin wings  
jumpin a' nothing standing One  
high good mamma's **Summertime**  
take daddy's till singing mornings  
rich Fish harm going spread  
sky

Created using: wordle.net



## Who owes how much to whom?



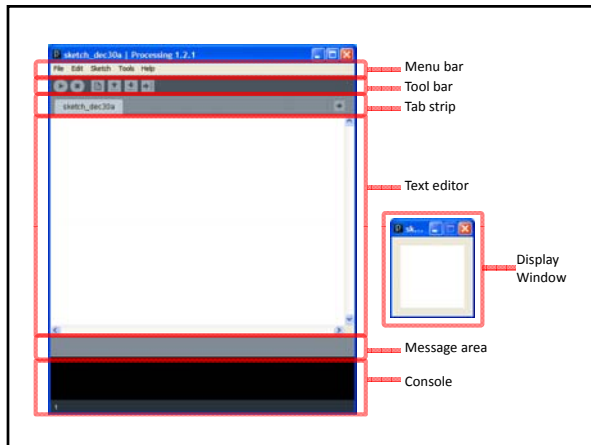
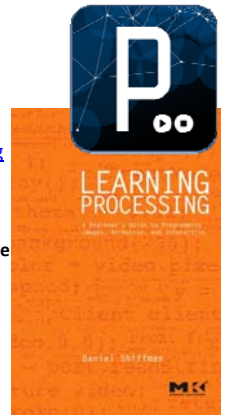
## Software

### Processing

- Already installed in the CS Lab
- Also available for your own computer @ [www.processing.org](http://www.processing.org)
- Processing == Java

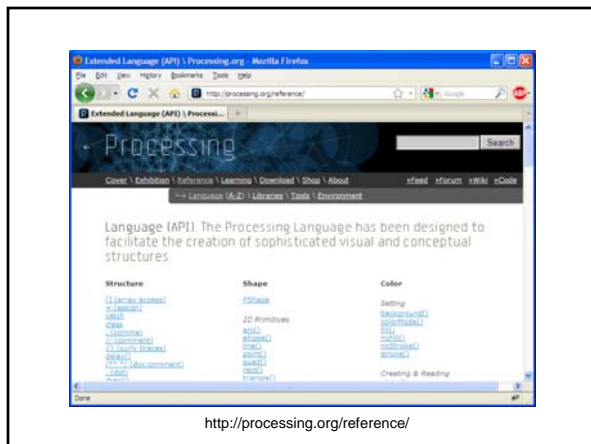
## Book

**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/>

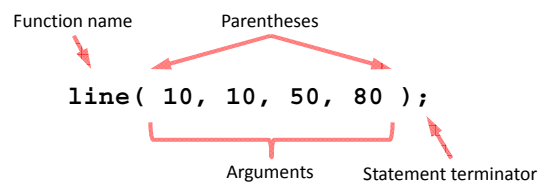


## Primitive 2D Shapes

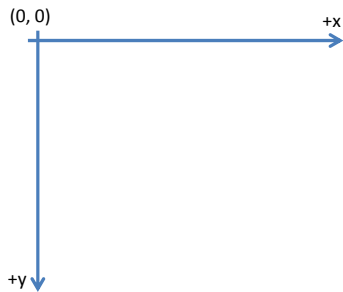
- point
- line
- triangle
- rect (rectangle)
- quad (quadrilateral, four-sided polygon)
- ellipse
- arc (section of an ellipse)
- curve (Catmull-Rom spline)
- bezier (Bezier curve)



## Anatomy of a Function Call



## Coordinate System



## Pixels



## Processing Canvas

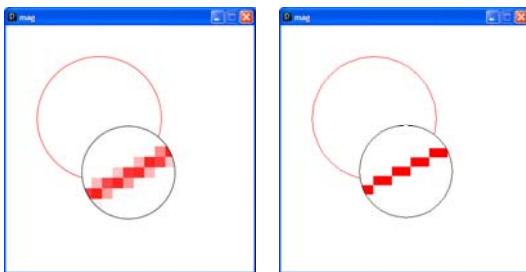
`size( width, height );`  
Set the size of the canvas.

`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:

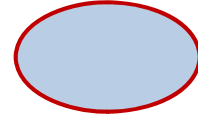
1. Red
2. Green
3. Blue
4. Alpha (Transparency)



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/strokeCap_.html)  
[http://processing.org/reference/strokeWeight\\_.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/ellipseMode_.html)  
[http://processing.org/reference/rectMode\\_.html](http://processing.org/reference/rectMode_.html)

## Dropbox

- <https://www.dropbox.com/>