

Administrivia

CMSC 110: Introduction to Computing Spring 2015

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

Instructor:

Jia Tao, Ph.D. (jtao@cs.brynmawr.edu)

Lectures

TuTh 2:25PM-3:45PM in Park 338

TA-Support

>20 hrs/week in Park 231

Open Labs (Optional)

Wed 10:00am – noon in Park 231

Grading

• 7 Assignments	56%
• 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.

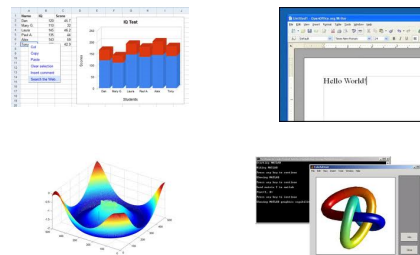


Class Lottery

- 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.alaneyes.com/2009/02/hdr-photography.html>

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

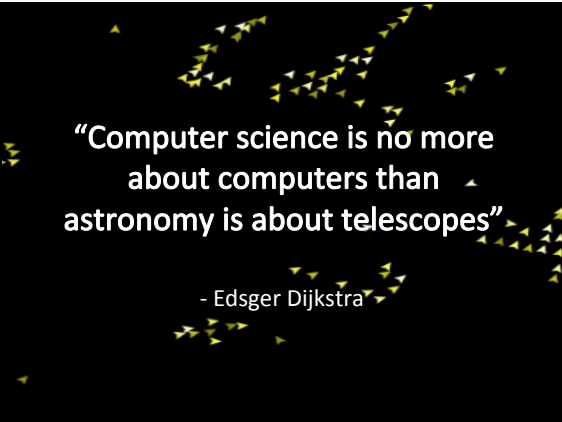
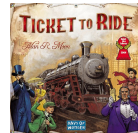
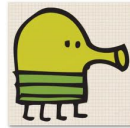
Computing: Entertainment...



Computing: Entertainment...



The collage features five distinct images. At the top left is a yellow, bird-like character with a long beak and green stripes. In the center is a cartoon illustration of Mario. To the right is the cover of the Madden NFL 03 video game. At the bottom left is a sequence of three small images showing a board game being played, with the first image labeled 'Board Game' and the second 'Playing Game'. At the bottom right is the cover of the Ticket to Ride board game.

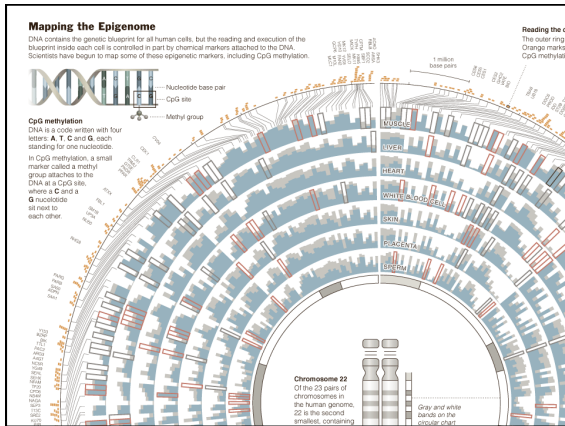


**“Computer science is no more
about computers than
astronomy is about telescopes”**

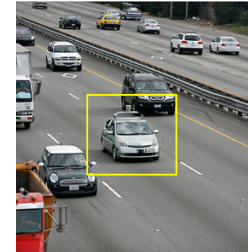
- Edsger Dijkstra

- Edsger Dijkstra

Cutting Edge Computer Science



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
(Mexico 2012)

ART



Prototypes
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:

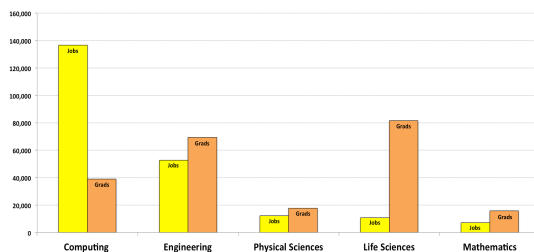
Mathematics	Geoscience	Medicine/Surgery
Biology (bioinformatics)	Archeology	Engineering
Chemistry	Psychology	Linguistics
Physics	Sociology	Art
Geology	Cognitive Science	...

Computing is important

Huge Growth in Computing-Related Jobs

Total Annual U.S. STEM Jobs Thru 2020 vs College Grads

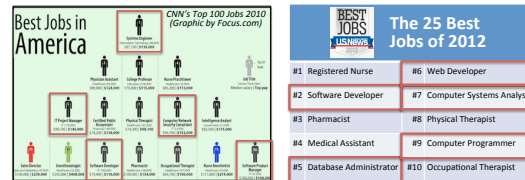
Job Openings Bachelors Degrees Awarded



Data Sources: US-BLS Employment Projections, 2010-2020 (http://www.bls.gov/emp/proj_table_2020.html); National Science Foundation Division of Science Resource Statistics (<http://www.nsf.gov/statistics/drs/2012/20120101.pdf>); NSF, 2013, p. 103; NSF, 2013, p. 104.

Computing is Consistently Ranked Among the Best Occupations

CS-Related Jobs Highlighted in Red

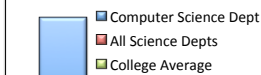


CS Careers Rank Highly In:

- Job satisfaction
- Salary
- Work/life balance
- Growth potential
- Employment rate
- Work environment

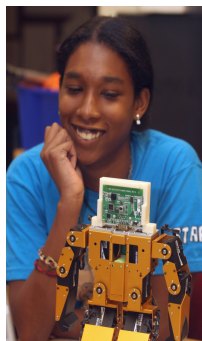
Strong Earnings Potential

Salaries of Bryn Mawr Graduates



Average Individual Annual Income

Office of Institutional Research, Planning, and Assessment
Bryn Mawr College



www.offices.com | August 2011 | 10 Years NEWS 21

Computer science tops list of best major for jobs

BY RACHEL SOTTIFRED

Computer science graduates get more offers of employment than any other major. This is the first time since 2005 that computer science has topped the list of best-paying majors.

In 2011, 36.2% of computer science majors received job offers, compared to only 25.8% of accounting majors. The offer rate for computer science majors increased 11.8% 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 Matt 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. But, getting five offers is 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.

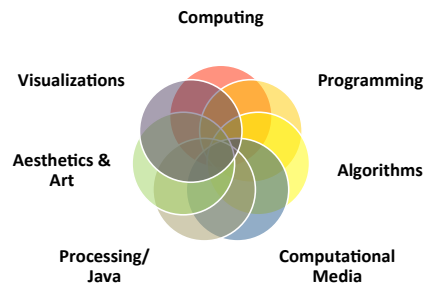
"Things change very quickly, especially in computer science," said Collins.

"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 in a computer science field."

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

Creative Introduction to ^ 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))) (setf r 10) (setf 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(54, 18, 40);
    e3 = new Eye(50, 200, 120);
    e4 = new Eye(150, 44, 40);
    e5 = new Eye(175, 120, 80);
    // setup()
}

void draw() {
    background(100);

    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()

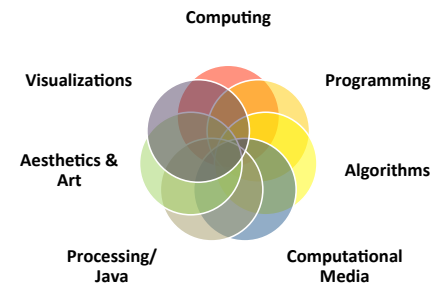
    void update(int mx, int my) {
        angle = atan2(my-ey, mx-ex);
    } // update()

    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
```

Our Goal

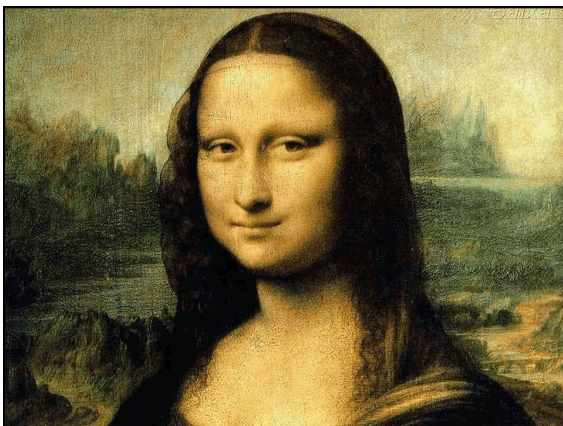
- Use computing to realize works of art
- Explore new metaphors from computing: images, animation, interactivity, visualizations
- Learn the basics of computing
- Have fun doing all of the above!

Introduction to ^{Creative} Computing



Examples

Shepard Fairey




[illegible]

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...




Learn to program while creating art and having fun

Processing

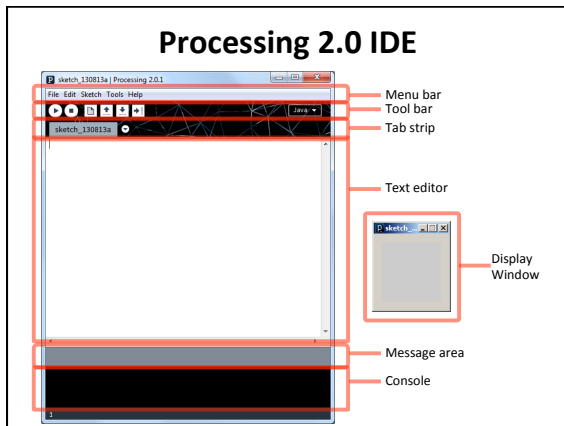
Creative Coding and Generative Art in Processing 2

Ira Greenberg
Dianne Xu
Deepak Kumar

 No Starch Press

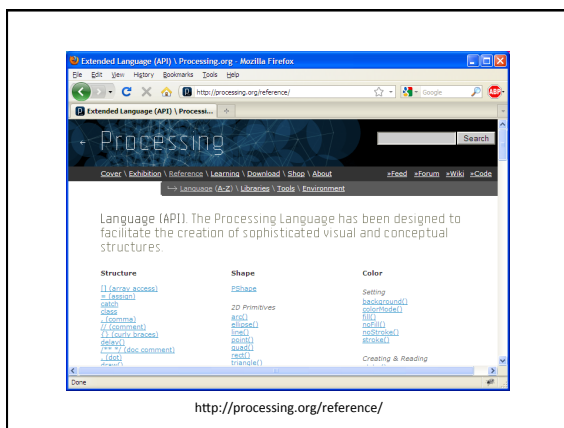
Homework

- 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)



Primitive 2D Shapes

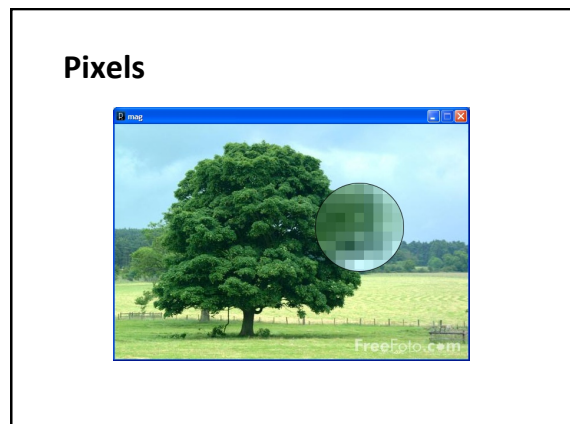
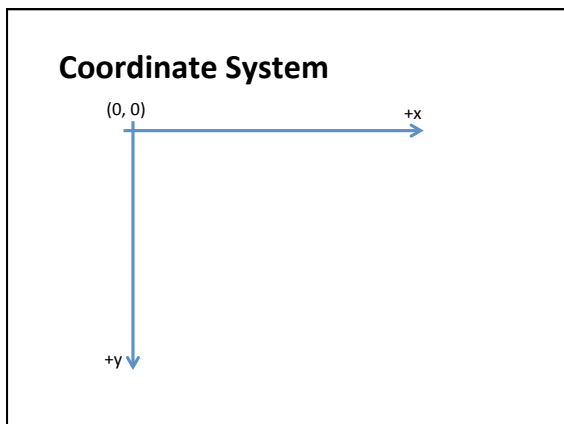
- point
- line
- triangle
- rect (rectangle)
- quad (quadrilateral, four-sided polygon)
- ellipse
- arc (section of an ellipse)
- curve (Catmull-Rom spline)
- bezier (Bezier curve)



Anatomy of a Function Call

The diagram illustrates the components of a function call: `line(10, 10, 50, 80);`

- Function name:** `line`
- Parentheses:** `()`
- Arguments:** `10, 10, 50, 80`
- Statement terminator:** `;`



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 );
```

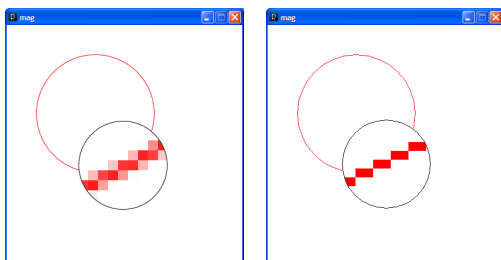
```
triangle( x1, y1, x2, y2, x3, y3 );
```

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

```
rect( x, y, width, height );
```

```
ellipse( x, y, width, height );
```

smooth() vs. noSmooth()



Colors

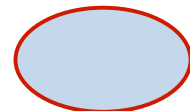
Composed of four elements:

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);
```

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

