CMSC 110
Introduction to Computing

Administrivia
CMSC 110: Introduction to Computing
Spring 2015
Course Website: http://cs.brynmawr.edu
Instructor: Jia Tao, Ph.D. (jtao@cs.brynmawr.edu)
Lectures
Tu/Th 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 50%
• 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: internet, e-mail, network...

Computing: Digital Photography

Computing: Entertainment...

Computing: Entertainment...

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

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
- Geology
- Physics
- Psychology
- Sociology
- Cognitive Science
- Engineering
- Medicine/Surgery
- Linguistics
- Art

Huge Growth in Computing-Related Jobs

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

<table>
<thead>
<tr>
<th>Job Type</th>
<th>Job Openings</th>
<th>Bachelor Degrees Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computing</td>
<td>10,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Engineering</td>
<td>5,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Physical Sciences</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Life Sciences</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Mathematics</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Computing is important

Computer is Consistently Ranked Among the Best Occupations

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

Strong Earnings Potential

Salaries of Bryn Mawr Graduates

- Computer Science Dept: $42,000
- All Science Depts: $30,000
- College Average: $18,000

Average Individual Annual Income

- Computer Science: $42,000
- All Science: $30,000
- College: $18,000

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

A more interesting program...

<table>
<thead>
<tr>
<th>Processing</th>
<th>Python</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

```
def areaOfCircle(radius):
    return PI*radius*radius;
```

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

```
(defun areaOfCircle (radius)
  (* PI radius radius))
```

```
(setq r 10)
(setq area (areaOfCircle r))
```
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!

Examples

Shepard Fairey

HOPE
Abstract

Art

Summertime

Word Cloud

President’s Inaugural Addresses

Map-based

Lyrics by George Gershwin

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 until that morning
There’s nothing can harm you
With daddy and mamma standing by
Your daddy’s rich
And your mamma’s good lookin’
So hush little baby
Don’t you cry
Your daddy’s rich
And your mamma’s good lookin’
So hush little baby
Don’t you cry

Summertime

Word Cloud
Box Office Earnings

Our Goal

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Let’s get started...

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  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)

**Anatomy of a Function Call**

- Function name
- Parentheses
- Arguments
- Statement terminator

```java
line( 10, 10, 50, 80 );
```

**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 );

Colors

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

Shape Formatting

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

Why 0 .. 255?

These are properties of your paintbrush, not of the object you are painting.
Fill Color

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

Stroke (Line) Color

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

strokeCap()

```java
strokeCap();
strokeCap(ROUND);
strokeCap(SQUARE);
strokeCap(PROJECT);
```

strokeWeight()

```java
strokeWeight();
strokeWeight(1); // Default
strokeWeight(4); // Thicker
strokeWeight(10); // Beastly
```

ellipseMode

```java
ellipseMode(CENTER);
ellipseMode(CORNER);
```

rectMode

```java
rectMode(CENTER);
rectMode(CORNER);
```