Programming

LBSC 690: Jordan Boyd-Graber

University of Maryland

November 12, 2012

COLLEGE OF
INFORMATION
STUDIES

Adapted from Jimmy Lin's Slides

Take-Away Messages

- Assignment 2 Review
- Midterm Recap
- Project
- Programming is a lot like cooking
- What kinds of programming languages are out there
- Basic programming you can use in webpages

Outline

1. Assignment 2 Review

2. Midterm

3. Project

4. Programming

Assignment 2

- Most did well
- CSS duplication
- Broken links
- Navigation inconsistent or missing
- Missing ALT tags and large images
  - Think about how it will display
  - Careful about large image sizes
- Lots of &nbsp; and <br / > for spacing

Outline

1. Assignment 2 Review
2. Midterm
3. Project
4. Programming

Midterm

- Answers posted
- You should be worried if you got below 20
- Difference between metadata and markup
- RAM is volatile, but you can make a SSD out of it
- Bits and bytes

Outline

1. Assignment 2 Review
2. Midterm
3. Project
4. Programming

Final Project

- Information available
- Form teams and get project idea soon
- Very broad scope
  - Use technologies from class
  - Do something interesting
- Chat with me (office hours, after / before class, e-mail) with idea

Outline

1. Assignment 2 Review

2. Midterm

3. Project

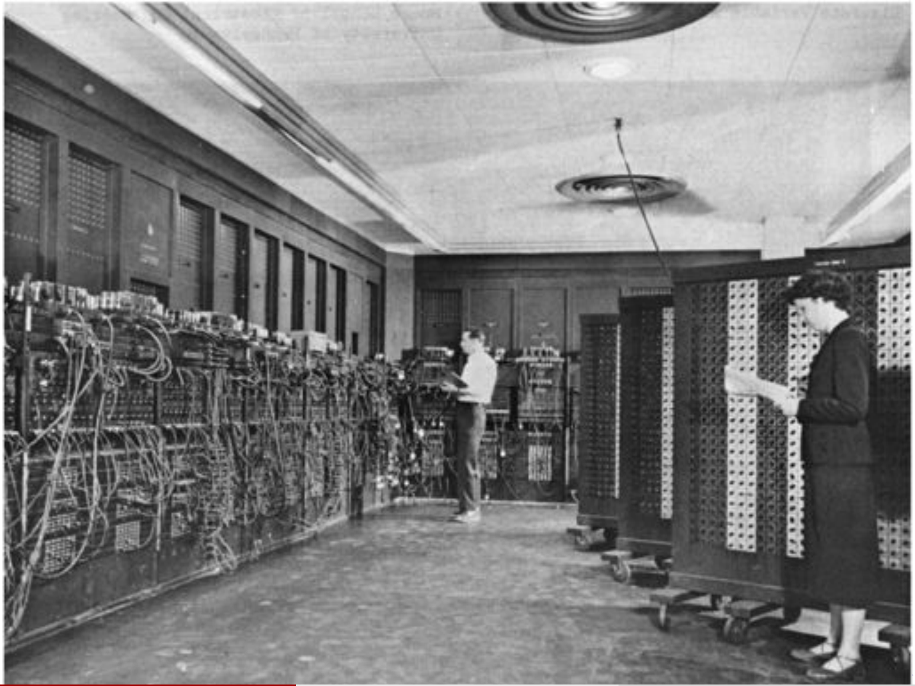
4. Programming

You will learn about. . .

- Different types of programming languages
- Basic programming constructs
- Controlling execution of instructions

Types of Software

- Application programs (e.g., PowerPoint)
  - What you normally think of as a “software”
- Operating system (e.g., Windows XP)
  - Software that manages your computing resources
- Compilers and interpreters
  - Software used to write other software
- Embedded software (e.g., TiVO)
  - Programs permanently embedded inside some physical device



Programming Languages

- Software "does something"
- Instructions for telling the machine "what to do" are expressed in a programming language
- Special purpose: geared towards specific tasks
  - Spreadsheets (e.g., Excel)
  - Databases (e.g., SQL)
  - Complex math (e.g., Matlab)
- General purpose: able to accomplish anything
  - Examples: Java, JavaScript, C, C++, Perl, Python ...

Why should you care?

- JavaScript: useful tool for making interactive webpages
- Knowing when you should ask for a programmer to help
- Helping diagnose problems in information technology
- Dealing with large amounts of information
- Automating simple tasks
- How to interact with Databases in friendlier way (e.g. HTML5)

Programming Ingredients

ingredients	data types
containers	variables
recipes	algorithms

Types of Programming: Low Level

- Directly specifies actions of the machine
- Example: assembly language

```
.model small
.stack
.data

main    proc
   mov    ax,seg message
   mov    ds,ax

   mov    ah,09
   lea    dx,message
   int    21h

   mov    ax,4c00h
   int    21h
main    endp
end main
```

Types of Programming: High Level

- Specifies machine instructions at a more abstract level
- Compiler/interpreter translates instructions into machine actions
- Example: Python

```
for ii in xrange(3):
  print ii, sum(x**ii for x in xrange(10))
```

How do you interact with programming languages?

- Compiled languages
  - Write a program as a plain-text file
  - Compile converts plain-text file into a executable
- Interpreted languages
  - Write a program as a plain-text file
  - Another program "runs" the file **or** allows you to interactively issue commands
- JavaScript

How do you interact with programming languages?

- Compiled languages
  - Write a program as a plain-text file
  - Compile converts plain-text file into a executable
- Interpreted languages
  - Write a program as a plain-text file
  - Another program “runs” the file **or** allows you to interactively issue commands
- JavaScript
  - Webpage is the source code
  - Browser is the interpreter

Data Types and Variables

- Data types = things that you can operate on
  - Boolean: true, false
  - Number: 5, 9, 3.1415926
  - String: “Hello World”
- Variables hold values of a particular data type
- Represented as symbols (e.g., x)
- In JavaScript, “var” declares a variable
  - create a boolean b and set it to true

    ```
    var b = true;
    ```

  - create a number n and set it to 1

    ```
    var n = 1;
    ```

  - create a string s and set it to “hello”

    ```
    var s = ''hello'';
    ```

Instructions

- Things that you can do:

$-x$	reverse the sign of x (negation)
$6 + 5$	Add 6 and 5 (numeric)
"Hello" + "World"	Concatenate two strings
$2.1 * 3$	Multiply two values

- Storing results:

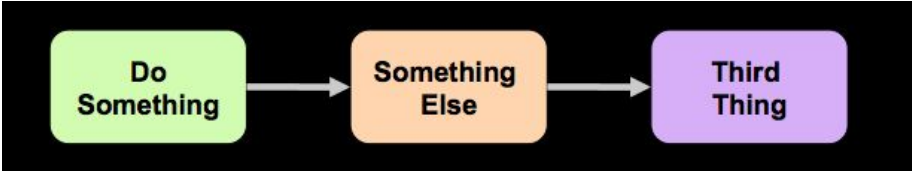
$x = 5$	set the value of x to be 5
$x+ = y$	$x = x + y$
$x* = 5$	$x = x * 5$
$x + +$	increase value of x by 1

- In JavaScript, all instructions end with a semicolon (;)

Controlling Execution

- Sequence
- Condition
- Repetition

Sequence



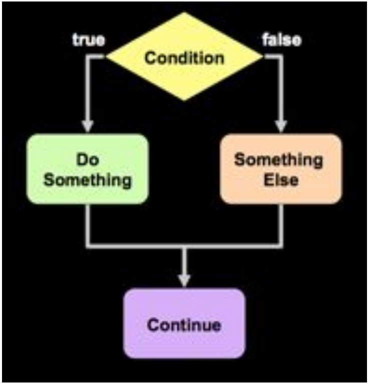
Do Something

Something Else

Third Thing

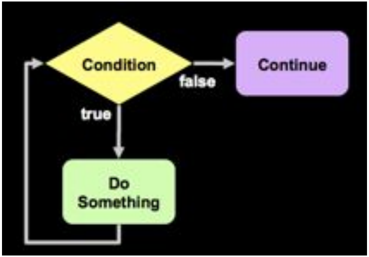
```
var a = 2;
var b = 3;
var c = a * b;
```

Condition



```
if (gender == ``male'') {
  greeting = ``Hello, Sir'';
} else {
  greeting = ``Hello, Madam'';
}
```

Repetition



```
n = 1;
while (n <= 10) {
  document.writeln(n);
  n++;
}

for (n = 1; n <= 10; n++) {
  document.writeln(n);
}
```

Test Conditions

$x == y$	true if x and y are equal
$x! = y$	true if x and y are not equal
$x > y$	true if x is greater than y
$x <= y$	true if x is smaller than or equal to y
$x\&\&y$	true if both x and y are true
$x\|\|y$	true if either x or y is true
$!x$	true if x is false

Arrays

- A set of elements grouped together
  - For example, the number of days in each month

  Each element is assigned an index
  - A number is used to refer to that element
  - For example, x[4] is the fifth element (count from zero!)
  - Arrays and repetitions work naturally together

Functions

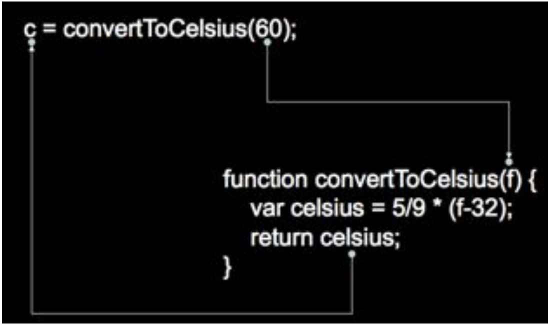
- Reusable code for doing a single task
- A function takes in one or more parameters and returns one value

```
function convertToCelsius(f) {
    var celsius = 5/9 * (f-32);
    return celsius;
}

function weirdAddition(a, b) {
    var result = a + b - 0.5;
    return result;
}
```

Calling Functions

- When you “call” a function, you invoke the set of instructions it represents



```
c = convertToCelsius(60);

function convertToCelsius(f) {
    var celsius = 5/9 * (f-32);
    return celsius;
}
```

More Functions

```
var f = 60;
c = convertToCelsius(f);

r = weirdAddition(2, 4);

var a = 2;
var b = 3;
r = weirdAddition(a, b);
```

Algorithms

- Derived from the name of the Persian mathematician Al-Khwarizmi
- A sequence of well-defined instructions designed to accomplish a certain task

Programming for the Web

- Common Gateway Interface (CGI) [Server-side]
  - User inputs information into a form
  - Form values passed to the sever via CGI
  - Program on the server generates a Web page as a response
- Specialized Servers: Souped up CGI
  - PHP
  - Tomcat / JSP
  - Google Webapp
- JavaScript [Client-side]
  - Human-readable source code sent to the browser
  - Web browser runs the program

Where is Javascript

- JavaScript is usually kept in the <head> section of an HTML document

```
...
<head>
<script language="JavaScript" type="text/javascript">
<!--
function calculate() {
  var num = eval(document.input.number.value);
...
  document.output.number.value = total;
}
//-->
</script>
</head>
...
```

Handling Events

- When does code actually get executed?
- Events:
  - User actions trigger events
  - Embedded in all modern GUIs
- Event handlers are used to respond to events
- Examples of event handlers in JavaScript
  - onMouseover: the mouse moved over an object
  - onMouseout: the mouse moved off an object
  - onClick: the user clicked on an object
  - onLoad: the page loads for the first time

Input and Output

- How do you get information to/from the user?
- Forms provide a method for accepting input and displaying output

HTML

```
<form name="input" action="">
 Please enter a number:
<input size="10" value=" " name="number"/>
</form>
<form name="output" action="">
 The sum of all numbers up to the number above is
<input size="10" value=" " name="number" readonly="true"/>
</form>
```

Javascript

```
var num = eval(document.input.number.value);
document.output.number.value = num * (num + 1) / 2;
```

Programming Tips

- Details are everything!
  - Careful where you place that comma, semi-colon, etc.
  - Write a little bit of code at a time
- Add a small new functionality, make sure it works, then move on
  - Dont try to write a large program all at once
  - Debug by outputting the state of the program
- Print out the value of variables using document.write; is the value what you expected?

You Have Learned About

- Different types of programming languages
- Basic programming constructs
- Controlling execution of instructions

Discussion Question

Modify social networking selector

http://umiacs.umd.edu/ jbg/teaching/LBSC_690_2011/javascript_demo/JavaScript_HELLO.html

- If you are younger than 15, it displays a list of five books you should read instead of using social networking sites (use an array).
- If you are younger than 24, it sends you to Facebook.
- If you are 24 or older, it sends you to LinkedIn.
- What else might you do to improve it?