

Introduction to Computer Science and Programming in C

Session 23: November 25, 2008

Columbia University

Announcements

- Homework 4 is out, due last day of class:
December 4 before class
- Final Review Thursday 12/4
- Final Exam: Tuesday, 12/16, 1:10 pm - 4:00 pm
Mudd 233 (our normal room)

Review

- Software Engineering:
 - Waterfall method
 - “Extreme Programming”
 - More interaction with customer, fast iterations, refactoring, pair programming

Today

- A look at C++ and Java

C Family

- Since C was so popular, many programming languages were designed based on C
- Two Object-Oriented languages derived from C are C++ and Java
- C++ in 1979 (C with Classes) / 1983 (C++)
- Java in 1995 (!)

C vs. C++

- C++ is compiled just like C into machine code (GCC includes C++ compilers with -lstdc++)
- New set of standard libraries
- Implements OOP “classes”
- Gives the programmer the choice of old-style, “procedural” programming or Object-Oriented

C vs. Java

- Compiled by javac (Java Compiler) into Virtual Machine Code. Run on Virtual Machine
- Java Virtual Machine is implemented on various systems to provide portability
- Strictly implements OOP classes
- Garbage collection (automates memory management)

Hello World

- ```
#include <stdio.h> /* Hello World In C */
int main()
{
 printf("Hello, World!\n");
}
```
- ```
#include <iostream> // Hello World In C++
int main()
{
    std::cout << "Hello, World!" << std::endl;
}
```
- ```
class HelloWorld { // Hello World In Java
 static public void main(String args[]) {
 System.out.println("Hello, World!");
 }
}
```



# hello.cpp

- ```
#include <iostream> // Hello World In C++
int main()
{
    std::cout << "Hello, World!" << std::endl;
}
```
- **iostream** is C++'s stdio.h
- `std::cout` is like `fprintf(stdout, "...", ...)`
- `std::endl` is like `\n`

HelloWorld.java

- ```
class HelloWorld { // Hello World In Java
 static public void main(String args[]) {
 System.out.println("Hello, World!");
 }
}
```
- **static**: **main** function belongs class HelloWorld
- **public**: it is accessible to other classes
- `System.out.println` is like `printf("... \n");`
- `String args[]` is an array of strings (like `*argv[]`)

# More examples: C

- ```
#include <stdio.h>
int main()
{
    float velocity = 11.2;

    printf("Earth's escape velocity is %f kph\n",
        velocity);

    return 0;
}

/* Example from Java Essentials for C and C++
   Programmers by Barry Boone */
```

More examples: C++

- ```
#include <iostream>
int main()
{
 float velocity = 11.2;

 std::cout << "Earth's escape velocity is "
 << velocity
 << " kph" << std::endl;

 return 0;
}

// Example from Java Essentials for C and C++
// Programmers by Barry Boone
```

# More examples: Java

- ```
class Escape {  
    public static void main (String args[]) {  
  
        float velocity = 11.2;  
  
        System.out.println("Earth's escape velocity is "  
                            + velocity  
                            + " kph");  
    }  
}
```

```
// Example from Java Essentials for C and C++  
// Programmers by Barry Boone
```

Classes and Methods

- The Java function, `System.out.println()` looks like we call a function that is a field in a struct.
- Recall the OOP definition of a class: a collection of variable fields and functions
- These functions are aka “methods”
- `println()` is a method of the object `System.out`

Overloading

- C++, Java can **overload** functions & operators
 - C is limited: one function per function name
`int square(int x);`
- e.g. multiple “square” functions that return and take different types (float, int, etc)
- e.g. the ‘+’ operator for strings automatically converts floats, ints, etc in Java

CS Department Course Offerings

- COMS 1007 - Taught in Java. More focused on OOP, and introduces graphics, networking
- COMS 3101 - Various 1-credit courses (should be light workload or only part of the semester) to learn a new language.