Lecture 29: Introduction to C

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Assignment / Lab

Lab 10: Working with input/output in C

Assignment 10: Binary heap priority queue

- Array based heap
- Review heap algorithms from book
- Read Bailey's implementation before you start

History of C

The C language was originally developed by Dennis Ritchie between 1969 and 1973 at AT&T Bell Labs, and wwas used to re-implement the Unix operating system. It has since become one of the most widely used programming languages of all time!

The C language provides constructs that map efficiently to typical machine instructions, and therefore it has found lasting use in applications that had formerly been coded in assembly language, including operating systems, as well as software for computers ranging from supercomputers to embedded systems.

For more on the history see: `https://en.wikipedia.org/wiki/C_(programming_language)`

Learning C

- C mostly removes features from Java
- Finding bugs in C code is hard!!! Make sure you have time to debug.
- Compilers warning/errors are getting better but are still pretty bad
- There are many helpful resources online:
  - Complete reference: `http://en.cppreference.com/w/c`
  - Nice tutorial with web IDE: `http://www.geeksforgeeks.org/c/`
  - An interesting book by Zed Shaw: `http://c.learncodethehardway.org/book/`

High-level differences with Java

Java	C
• Compiles to byte code; runs on JVM	• Compiles to native code; runs on CPU
• Garbage collection	• No garbage collection
• High level concepts: objects, exceptions	• No high level concepts; close to assembly
• Safety by default	• Safety left to programmer and third party solution

Similarities with Java

- Primitives: short, int, long, float, double, boolean, char, "void"
  - C adds a distinction between signed and unsigned
- Syntax
  - Curly brackets and semicolons
  - Function syntax
  - Control constructs: while, for, if-else, switch
  - The "." operator for instance variables

C Structs vs Java Objects

C:

```
struct point
{
    int x;
    int y;
};
```

Java:

```
public class point
{
    public int x;
    public int y;
}
```

- Can only have public instance variables
- No methods
- Can be stack allocated like a primitive type
- Cannot directly contain an instance of itself

CS 62: Environment

Text editor and terminal commands!

- Text editor
  - Any editor with syntax highlighting will work
  - Recommended: Aquamacs or TextWrangler
- Compiler
  - clang 3.7 on OS X Yosemite
  - NOT the default version of clang on OS X
- Makefile
  - Types long commands so you don't have to
  - You will use the commands: make, make run, make memcheck, make package, make package-nocompile, make clean

Example Code

- Some sums
- Points and dots