Autumn 2012

CSE2421 Systems1
Introduction to Low-Level Programming and Computer Organization

Kitty Reeves
TWRF 12:40-1:35pm
TWRF 3:00-3:55pm
CSE2421 = Alice in Wonderland

A look into the rabbit hole...
Introduction

Website

http://www.cse.ohio-state.edu/~reeves

Syllabus

Course Description
Pre-requisites
Objectives
Textbook – Safari online an option
Grading Policy
Lab locations – submission info given on Day 2
Academic Misconduct

Thursday possible lab day
BE0310 definitely for the 1st two weeks
Why C?

- Age has its advantages
  - C has been around for ~40 years
  - C is a great language for expressing common ideas in programming in a way that most people are comfortable with (procedural language)
- Portable, versatile, simple, straight-forward
- Reasonably close to the machine
  - Low-level access to memory
  - Provide language constructs that map efficiently to machine instructions
  - Requires minimal run-time support

*** C has the best combination of speed, low memory use, low-level access to the hardware, and popularity ***

If you dare: http://en.wikipedia.org/wiki/C_(programming_language)
OK, really... why C?

- Is there a size problem?
  - Size is part of the issue, but so is speed.
  - C is lightweight and fast.

- I hate garbage
  - No garbage collection
  - Fun memory leaks to debug

- Power...
  - To optimize
  - Write drivers
  - Get a job in micro processing technology
  - Write my own OS
## C vs Java/C++

### Programming language rankings

<table>
<thead>
<tr>
<th>Speed</th>
<th>Portability</th>
<th>Object Orientation</th>
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### Pointers to memory
- Platform dependent types
- Programmer allocated memory
- Declare variables at start of block

### References to objects
- Types have well defined sizes
- Automatic garbage collection
- Declare variable anywhere
C History and background

What is C?
- C is a programming language originally created for developing the Unix operating system. It is a low-level and powerful language, but it lacks many modern and useful constructs.
- C is a simple programming language with few keywords and a relatively simple to understand syntax.
- C is also useless (whaaaaaaaaaaaaattt???). C itself has no input/output commands, doesn't have support for strings as a fundamental (atomic) data type. No useful math functions built in.
- Because C is useless by itself, it requires the use of libraries. This increases the complexity of C. The issue of standard libraries is resolved through the use of ANSI libraries and other methods.

Three traditional aspects of the C language:
- Characters are promoted to integers before being used for any type of arithmetic.
- The default character type, either signed or unsigned, is not specified by the Standard so that the implementer can choose whichever is most efficient for a particular machine.
- There is no range checking on array subscripts.
BRIAN KERNIGHAN QUOTES

- Controlling complexity is the essence of computer programming.
  

- The most effective debugging tool is still careful thought, coupled with judiciously placed print statements.
  
  "Unix for Beginners" (1979)

- Everyone knows that debugging is twice as hard as writing a program in the first place. So if you're as clever as you can be when you write it, how will you ever debug it?
  
  "The Elements of Programming Style", 2nd edition, chapter 2

- Do what you think is interesting, do something that you think is fun and worthwhile, because otherwise you won't do it well anyway.
  
  *An Interview with Brian Kernighan* from the PC Report Romania[1]

- Advice to students: Leap in and try things. If you succeed, you can have enormous influence. If you fail, you have still learned something, and your next attempt is sure to be better for it.

- Advice to graduates: Do something you really enjoy doing. If it isn’t fun to get up in the morning and do your job or your school program, you’re in the wrong field.
  
  "Leap In and Try Things: Interview with Brian Kernighan"[2] from *Harmony at Work blog*[3]