COP 3503

Programming Fundamentals for CIS Majors II

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ACM/IEEE-CS Computer Science Curricula (CS2013)

(1) AL – Algorithms and Complexity

(2) AR – Architecture and Organization

(3) CN – Computational Science

(4) DS – Discrete Structures

(5) GV – Graphics and Visulaization

(6) HCI – Human-Computer Interaction

(7) IAS – Information Assurance and Security

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(8) IM – Information Management

(9) IS – Intelligent Systems

(10) NC – Networking and Communications

(11) OS – Operating Systems

(12) PBD – Platform-based Development

(13) PD – Parallel and Distributed Computing

(14) PL – Programming Languages

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(15) SDF – Software Development Fundamentals

(16) SE – Software Engineering

(17) SF – System Fundamentals

(18) SP – Social Issues and Professional Practice

About the Course

This course serves as an introduction to the "fundamentals" of computer science

- based on C++ (and the underlying C)

We will examine the programming paradigm known as "object-oriented programming."

- data structures, algorithms, systems and applications

What is Computer Science?

Computer science is ***not*** just coding.

Instead, computer science is about the underlying **principles** that allow for the design and implementation of **efficient** programs.

These issues exist, no matter which programming language is used.

What is Computer Science?

There are a lot of different ways to sort objects, or what we like to call *data*.

- One of the more intuitive methods is known as an *insertion sort*.
  - You keep the sorted part of your data separate from the unsorted part, placing each newly sorted object into the correct location into the currently sorted section.

What is Computer Science?

There are a lot of different ways to sort objects, or what we like to call *data*.

Another sorting method is called *Quicksort*.

This method works by picking an approximate "median" for the data you want to sort, then throwing all the rest of the data to either the "high" side or the "low" side.

Once that's complete, you sort the "high" side and the "low" side in the same manner.

What is Computer Science?

There are a lot of different ways to sort objects, or what we like to call *data*.

- We will likely examine these in much greater detail later.

Note that both techniques accomplish the same goal in different ways.

Why Study Computer Science?

In computer science, it's encouraged to learn many different ways of handling the same problem.

At the same time, it teaches you how to evaluate the pros and cons of each.

- Some techniques are superior to others for special circumstances.

Origins of C (and C++)

- C is a by-produce of UNIX, developed at Bell Lab by KenThompson, Dennis Ritchie and others.
- Thompson designed a small language named “B”.
- “B” was based on BCPL, a system programming language developed in the mid-1960s.

Origins of C (2)

- By 1971, Ritchie began to develop an extended version of “B” language.
- He called the new language “NB” (New B) at first.
- As the NB language began to diverge more from B, he changed its name to C.
- The C language was stable enough by 1973 that UNIX could be re-written in C.

The Year of 1973

- PC/Internet are not invented (totally) yet!!
- Computers mostly mean “super computers”, “main-frame computers” and “minicomputers” (e.g., DEC PDP-7)

Standardizations of C

C Became popular during the 1980s, both for UNIX programming and for developing applications for personal computers.

- *K&R C:* Described in Kernighan and Ritchie, *The C Programming Language,* Prentice-Hall, 1978; The de-facto standard

- *ANSI C (ISO C, C89):* ANSI standard X3.159-1989 (completed in 1988; formally approved in December 1989); International standard ISO/IEC 9899:1990

- *C99:* International standard ISO/IEC 9899:1999; Incorporates changes from Amendment 1 (1995)

Here came the C++

Bjarne Stroustrup, a Danish and British trained computer scientist, began his work (in AT&T) on **C++'s** predecessor "C with Classes" in 1979.

The motivation for creating a new language originated from Stroustrup's experience in programming for his Ph.D. thesis.