Lecture 1: CS2400 Introduction to Computer Science

- Introduction to the course
- Introduction to computers
- Ethics
- Programming
- C++

Computer Science

What is computer science?

- Using computers
- Mathematics/Logic
- Science
- Engineering
- Communication
- Everything? Multidisciplinary!

Why do you study it?***To Solve Problems!***

A Brief History of Computer Science

- Abacus 1000 BC
- Napier's Bones AD 1614
- Slide Rule 1700's
- Mechanical Adding Machines 1800's
- Tabulating Machines (early IBM) 1930
- Vacuum Tubes ENIAC 1945
- Machine Language
- Transistors/Magnetic Core 1950's-1960's
- Assemblers/Compilers UNIVAC 1 IBM 704

- IC's OS/Timesharing 1960's-1970's
- Supercomputers
- Microprocessors 1980's/ Workstations
- Networking, WWW, Nintendo 64, etc.

Three classes of Computers:

- PCs
- Workstations
- Mainframes

Main Components of a Computer

- Input devices
- Output devices
- Secondary Memory
- Main Memory
- CPU
    - Arithmetic/logic Unit
    - Control Unit

Memory

What is memory?

bit - binary digit

bytes - an 8-bit portion of memory

address

memory location - a group of memory that holds a datum

Codes

A ***code*** is a way of representing data in the computer.

Example ASCII (American Standard Code for Information Interchange) - the letter A is represented as:

01000001

But this is also the code for the number 65.

Secondary Memory

The memory that we have been talking about so far is the main memory, used to execute computer programs.

There is also secondary memory in a computer. What is its use?

Information kept in secondary storage are kept in units called files.

Examples of secondary memory:

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Examples of secondary memory: ***hard disks, pen drives, diskettes, CD-ROM.***

CPU

The “BRAIN” of the computer.

What can a CPU do for you?

CPU

The “BRAIN” of the computer.

What can a CPU do for you?

ALU - arithmetic, logic

Control Unit - executes the code, branches, fetches memory, etc.

Operating System

Windows 7, Windows 10

Unix/Linux

MacOs

ios

What does an operating system do for your computer?

A Program

What is a program?

A Program

What is a program?

A ***program*** is a set of instructions for a computer to follow.

Input to the computer is a program and some data.

data is the input to the program

running a program
data is also said to be any information available to the computer.

Computer Languages

- High-level

C, Pascal, FORTRAN, BASIC, COBOL, Lisp, Scheme, Ada, Modula-2, SmallTalk, Prolog, and C++.

- Low-level

Assembler

- Machine language

Main difference between high-level and machine-language -- high-level languages must be translated into machine language to be executed.

Why Study C++?

C++ is a superset of C. C was developed to write the UNIX operating system.

Problems with C:

- It encourages programmers to write large systems that lack structure!
- It encourages beginning programmers to learn bad habits - writing code that is difficult to read and maintain.
- C lacks many of the fail-safe features of modern programming languages.

C++ was developed in the 1980's by **Bjarne Stroustrup**.

It has all the bad features of C, but also has additional features.

If the additional features are properly used, they can alleviate many of the problems with C.

In particular, C++ supports ***object-oriented programming***.

C++ is a much larger and more sophisticated language than C.

We will be studying a subset that is manageable.

Compilers

A ***compiler*** is a program that translates a high-level language (C++) to a machine-language.

What is the input to the compiler?

What is the output?

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A ***compiler*** is a program that translates a high-level language (C++) to a machine-language.

What is the input to the compiler?

source program, or source code

What is the output?

object program, or object code

How to run a C++ program

1.) write the code and place in a file.

2.)

3.)

4.)

How to run a C++ program

1.) write the code and place in a file.

2.) ***run the compiler on the program***

3.) ***link the machine code to other existing code***

4.) ***run the resulting machine code***

Programming and Problem-Solving

Computers are ***STUPID!!***

In order to get them to do what we want we must be extremely precise in how we order them to do it.

This process is the process of writing an ***algorithm***. The subsequent step of converting the algorithm to a particular computer language is called ***coding***.

The hardest part of most programming problems is to come up with the algorithm. Once that is done, coding the problem becomes much easier.

Definition: an ***algorithm*** is a sequence of precise instructions that leads to a solution.

Example:

Write an algorithm to write your name on the blackboard.