


COMP1511: Introduction To Computers and C

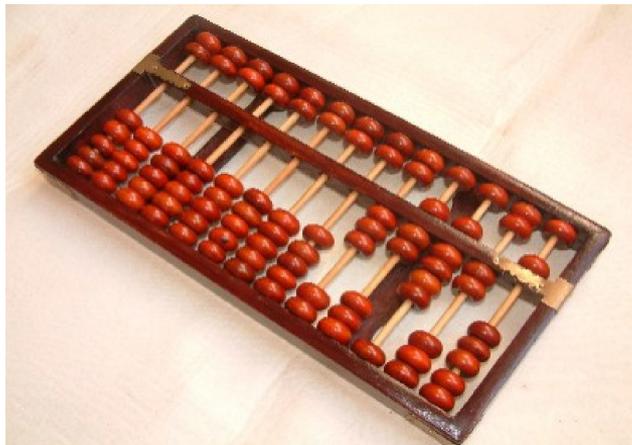
Session 2, 2018





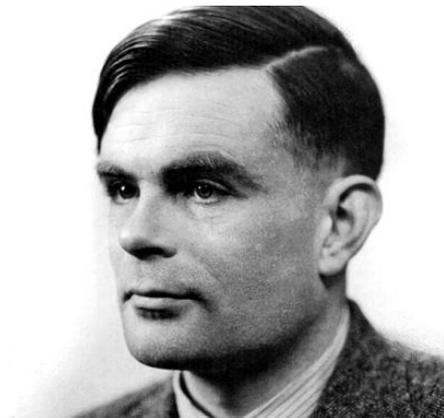
Computers

- “Computers” have existed for 1000’s of years
- For example, Abacus invented Sumeria c. 2500 BC,



- But, until 20th century, were specialised/simple devices

Computers (cont)



Modern computers are

- electronic, digital, **stored-program**
- able to realise **any computable function**
 - demonstrated by Alan Turing in the 1940's

- **Alan Turing** is widely considered to be the **father** of theoretical **computer science** and **artificial intelligence**.
- During the Second World War, Turing worked at Britain's codebreaking centre that produced **Ultra intelligence**.

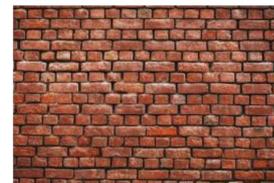
Algorithms and Programs

An algorithm is a set of (specific) instructions to accomplish a goal.

For example,

- make a cake
- build a wall
- sort a list of names

Similarly, a computer program is a set of instructions in a programming language (like C or Java or Python) that accomplish a goal.



Popular Baby Names

Top 10 Names for 2010

Rank	Male name	Female name
1	Jacob	Isabella
2	Ethan	Sophia
3	Michael	Emma
4	Jayden	Olivia
5	William	Ava
6	Alexander	Emily
7	Noah	Abigail
8	Daniel	Madison
9	Aiden	Chloe
10	Anthony	Mia

Programs

A program needs to be

- sufficiently detailed
- unambiguous
- eventually leading to goal

So we don't use English for programming

Programs

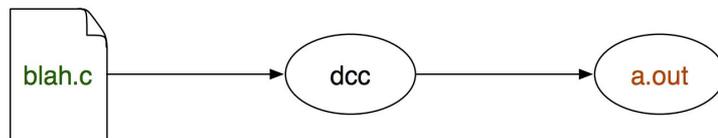
A program is a text document, containing

- a description of an algorithm
- expressed in a programming language (like C, Java, Python, etc.)

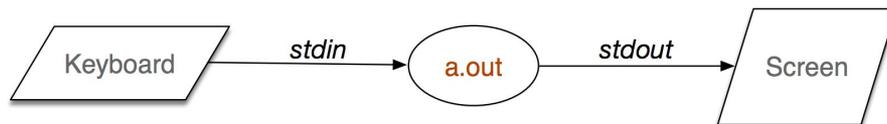
It cannot be directly executed on a computer

- need to translate to executable machine code

Compilation



Execution



Programs

Typical program structure

- get input values
- process input to compute result
- display result

The C Programming Language

C is an important programming language

- relatively simple, widely used and forms the basis for many other languages
- venerable (developed in early 70's by Thompson & Ritchie)
- named so because it succeeded the B programming language
- widely used for system and application programming, powerful enough to implement the Unix kernel
- classic example of an imperative language
- widely used for writing operating systems and compilers as well as industrial and scientific applications
- provides low level access to machine, language you must know if you want to work with hardware

The C Programming Language

Like most programming languages, C supports features such as:

- program **comments**
- declaring **variables** (data storage)
- **assigning** values to variables
- performing **arithmetic** operations
- performing **comparison** operations
- **control structures**, such as branching or looping
- performing **input** and **output**

Hello World

```
// Author: Kernighan and Ritchie  
// Date created: 1978  
// A very simple C program.
```

```
#include <stdio.h>
```

```
int main(void) {  
    printf(" Hello world!\n");  
  
    return 0;  
}
```

Hello World

The program is complete, it compiles and performs a task. Even in a few lines of code there are a lot of elements:

- a comment
- a `#include` directive
- the main function
- a call to a library function, `printf`
- a return statement
- semicolons, braces and string literals

A Closer Look

What does it all mean?

- `//`, a single line comment, use `/* */` for block comments
- `#include`, import the standard I/O library
- `int main(...)`, the main function must appear in every C program and it is the start of execution point
- `(void)`, indicating no arguments for main
- `printf(...)`, the usual C output function, in `stdio.h`
- `("Hello world!\n")`, argument supplied to `printf`, a string literal, i.e., a string constant
- `\n`, an escape sequence, special character combination that inserts a new line
- `return 0`, a code returned to the operating system, 0 means the program executed without error

The C Compiler

- A C program must be translated into machine code to be run.
- This process is known as compilation.
- It is performed by a compiler.
- We will use a compiler named `dcc` for COMP1511
- **`dcc`** is actually a custom wrapper around a compiler named **`clang`**.
- Another widely used compiler is called **`gcc`**.

Compiling A Program

- Create a file named `hello.c` containing the program
`gedit hello.c`
- Once the code is written and saved, compile it:
`gcc hello.c`
- Run the program:
`./a.out`

```
$ gedit hello.c &
```

```
$ gcc hello.c
```

```
$ ./a.out
```

Linux command “ls”

- Lists files in current directory (folder)
- Several useful switches can be applied to ls
 - ▶ `ls -l` (provide a long listing)
 - ▶ `ls -a` (list all file, i.e., show hidden files)
 - ▶ `ls -t` (list files by modification time)
 - ▶ Can combine options. For example, `ls -la`

Linux command “mkdir”

- `mkdir directoryName`
- Create (make) new directory called *directoryName* in the current working directory
- a directory is like a folder in windows
- To verify creation, type `ls`

Linux command “cd”

- `cd directoryName`
- Change directory
 - ▶ Change current directory to *directoryName*
 - ▶ *directoryName* must be in the current working directory
 - ▶ We will see how to use more complex names(paths) later
- Special directory names
 - ▶ `cd ..`
 - ▶ move up one directory (to parent directory)
 - ▶ `cd ~`
 - ▶ move to your home directory