CSE13S notes
Week of 1/10/23

History of C

- Derived from B, written by Ken Thompson
- Created on 1972

About C

- C lacks I/O, but manages to simulate I/O through system calls
- Uses POSIX system calls which are included in almost all systems
- Every program includes a main function
    - Main function should return int, 0 if successful and a non-zero number is not successful
- To run a program: “./hello”
    - ./ specifies current directory
- Low level language, is very close to the machine
- Clarity is paramount in C, very easy to write unreadable code

READ THE C PROGRAMMING LANGUAGE BOOK

- C is a “curly brace” language
- {} are used to create blocks of code and group statements
    - Blocks introduce a local scope
- While() is a loop statement, simplest statement
- printf() is just a function in the standard I/O library
- for() is a more advanced loop statement
    - For loop initialization is explicit, can be easier to understand
- Be clear in your code!

Declaring variables

- In C, you must declare a variable before you can use it
- Declaring a variable means you have to specify it’s type
    - This includes char, int, float, double
    - There are more, but we will focus on the above first
- Scope: determined by pairs of {curly braces}
    - Scope of a variable tells us where that variable exists

```
{
      Float x = 1.3;
      {
            Float y = 1.2; //y only exists within this block
      }
      //x exists both within the block with the y and this block
```

}

- If () statement
    - Executes the next statement only if the boolean expression within the if is true
    - Always use {} following an if statement

1/13/2023

- Look into gnuplot, monte carlo simulations
- We may not get test scripts and binaries for some assignments
- Design your program according to specs
    - All programs have bugs
- Def “fuzzing” : giving functions random inputs to make sure it doesn’t crash

Boolean Algebra

- George Bool : sought to set mathematics on a “logical foundation”
- Bool logic has only 2 values: true and false
- There are three basic operators
    - ^ : known as AND or conjunction (&& in C)
    - ∨ : known as OR or disjunction (|| in C)
    - Recall CSE16
- TRUTH tables will be on the quiz

True and False in C

- In C, “0” (zero) is false
- All non-zero numbers are true
- Logical expressions have type int
- True and false can be used with <stdbool.h>
    - Include <stdbool.h> in your code

If() statement

- Executes next statement if boolean expression within is true
- {} brackets are not required for single statements but should always be used
    - This practice avoids errors when adding statements
- You can nest if statements, but make use of curly braces!!!!

Short circuit for boolean expressions

- *False* && anything = *false*
- Stops evaluating when result is known
    - This helps prevent dividing by zero and following null pointers

Switch() statements

```
switch(expression) {
      case 1:
            x;
            break;
      case 2:
            y;
            break;
}
```

- Always include a break after every case!
- Do not use goto statements!!!

Loops

- Loops allow you to repeat sequences of code
- **While() : top test loop**
- **For() : top test loop**
- **Do {} while () : bottom test loop**
- Infinite loops [ex: while(1) or while(true)]
    - Use break statements to exit in the middle of loops
- goto()
    - Never use it!
    - Only exception is non-local error handling
    - It should only be used to help solve errors
- Continue;
    - Unlike break, it goes back to the beginning of loop and skips everything that follows
    - Try using this sparingly

Pay attention to errors!

- If you have a syntax error, it makes errors after the first one unreliable!