

System-level Programming

Avery Karlin

Fall 2015

Contents

1	Learning C	3
1.1	C Primitive Variable Types	3
1.2	C Programming	3
1.3	C Structures	3
1.4	Memory Management	4

Teacher: Dyrland-Weaver

1 Learning C

1.1 C Primitive Variable Types

1. All C primitives are numeric, divided purely based on variable size, and integer or floating point
 - (a) C variables have sizes based on the platform they were compiled by and for, such that `sizeof(type)` can be used to determine the size in bytes
 - (b) On a standard computer, `int` = 4, `short` = 2, `long` = 8, `float` = 4, `double` = 8, and `char` = 1 bytes (8 bits to a byte)
 - (c) Types can also be specified as unsigned, such that it is not able to be given a negative value
2. Boolean values are numbers, such that 0 is false, and all nonzero numbers are considered true
3. Character literals can be represented inside single quotes rather than use a number, and Strings, though not an object, can use a double quotes literal
 - (a) Strings are created by character arrays, using a null character (value 0), to show the end of the array, allowing it to be modified easier
4. Variables are able to be initialized within a for loop, but are not able to be declared, such that it must be before the loop

1.2 C Programming

1. All C programs are made up of a series of functions, run within the main function, which returns an integer (typically 0, or other values for errors)
 - (a) They are compiled through “`gcc file.c -o program_name`”, then run through “`./program_name`”
2. Libraries are added, either `.h` files from the current directory through `#include “file.h”` or through premade libraries by `#include <file.h>`
 - (a) All files typically start with calling the C library with `#include<stdio.c>` and `<stdlib.h>`
3. The man pages, called by “man command” or “man section command”, give information on both bash and C commands
 - (a) (1) is user commands, (2) is system calls, (3) is library functions, such as the C libraries, (4) is devices, (5) is file formats, (6) is games and amusements, (7) is conventions and miscellany, and (8) is system admin and priveledged commands
 - (b) (L) is used for local commands, installed by certain programs

1.3 C Structures

1. “`printf(text, var1, var2)`” is used to print a String in terminal, where the text is a formatted string, with placeholders for variables following

- (a) %f is a placeholder for a float, %d for double, %c for char, %s for string, %f for pointer, %lf for double, %ld for long, and %d for int
- 2. Arrays in C are non-dynamic, such that they must have a fixed size, with no length function, and there are no errors for going outside boundaries, rather going to a different point in memory
 - (a) Arrays are declared by “type[size];” and must be initialized each part at a time

1.4 Memory Management

- 1. Memory allocation is either during compile time (static stack memory), or during runtime (dynamic heap memory)
- 2. Compiler allocated memory is packaged within the binary, unable to overwrite other programs memory due to protected memory, without a default value, where variables and arrays are allocated
- 3. Runtime memory is temporary, used for values of variables