

CPE 325: Embedded Systems Laboratory

Laboratory Assignment #2

Assignment

[50 pts]

1. Write a C program that will print the sizes and ranges of common data types **char**, **short int**, **int**, **long int**, **long long int**, **unsigned char**, **unsigned short int**, **unsigned int**, **unsigned long int**, **unsigned long long int**, **float**, and **double**. Your program's output should be like the following:

Data Type	Size (in bytes)	Minimum	Maximum
char	1	0	255
short int	2	-32768	32767
(additional data types goes here)			

Note: You should use definitions given in the **limits.h** and **float.h** header files for the ranges of data types. For float and double, display positive minimum value in *Minimum* column.

2. Compute the maximum and minimum values of a data-type whose size is 4 bytes by hand. Perform this computation considering the data-type to be (a) unsigned and (b) signed. This computation may be done on paper and copied into the submission or solved in a word document.

In the list of data types that you printed in Q1, which data types are 4-bytes. Does your maximum and minimum values match with your output in Q1?

3. Write a C program that declares and initializes two integer arrays *x* and *y*. They should have at least 5 elements. You are required to compute float array *z* such that each element of *z* is the subtraction of the corresponding elements in *x* and *y*. Your output should look something like following:

Input Array x: [-1 2 5 3 -5 6]

Input Array y: [-7 8 23 13 23 28]

Output Array z: [6 -6 -18 -10 -29 -22]

(Define new Arrays for Lab)

- (Bonus: Up to 5 pts)** Write a C program that performs the matrix multiplication on two 8x8 matrices with all values 1 for matrix A and 2 for matrix B. Display your input matrices and final result matrix.

Questions To Be Addressed

Please make sure that you have addressed the following in your demonstration:

1. How are format specifiers used in your Q1 program?
2. How are you calculating the output matrix in Q3?
3. Show console output for both the questions Q1 and Q3.

Topics for Theory

1. Different data types
2. Size limit of data types
3. Endianness

Deliverables

1. Lab report which includes:
 - a. Flowchart for part 3 only
 - b. Output screenshots (& inputs)
2. Source files (.c or .cpp files)

Note:

- During demonstration, you are expected to know the size of basic data types and should be able to calculate the range of the data type for a given size.
- Use this link to learn how to print different data types in C
<http://personal.ee.surrey.ac.uk/Personal/R.Bowden/C/printf.html>