CSC3320 System Level Programming
Lab Assignment 9 - Post-Lab
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Due at 11:59 pm on Sunday, March 21, 2021

Purpose: Learn how to use array in C. Understand the basic memory address in C.

Part 1:

Write a C program named as getMostFreqChar.c that finds the most frequent letter from the input via ignoring the case sensitive and prints out its frequency. For example, sample outputs could be like below

$cat test.txt
This is a list of courses.
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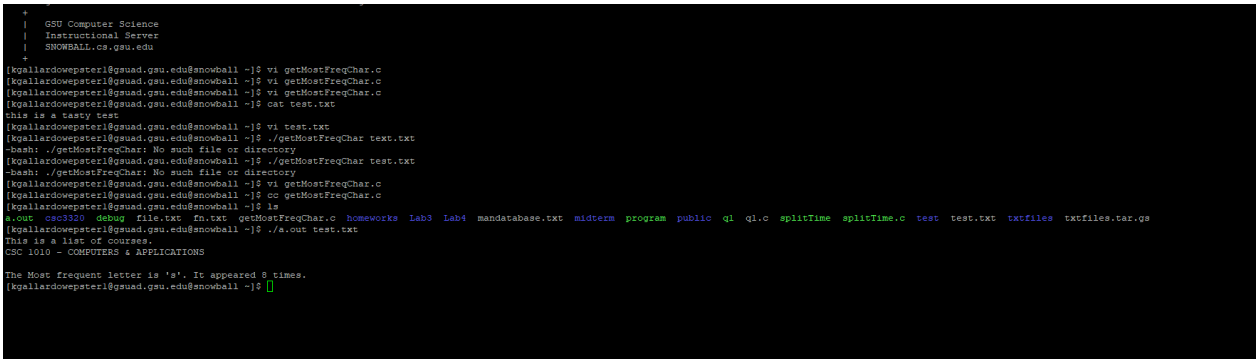
$./getMostFreqChar test.txt
The most frequent letter is 's'. It appeared 8 times. Run the C program,

attach a screenshot of the output in the answer sheet.

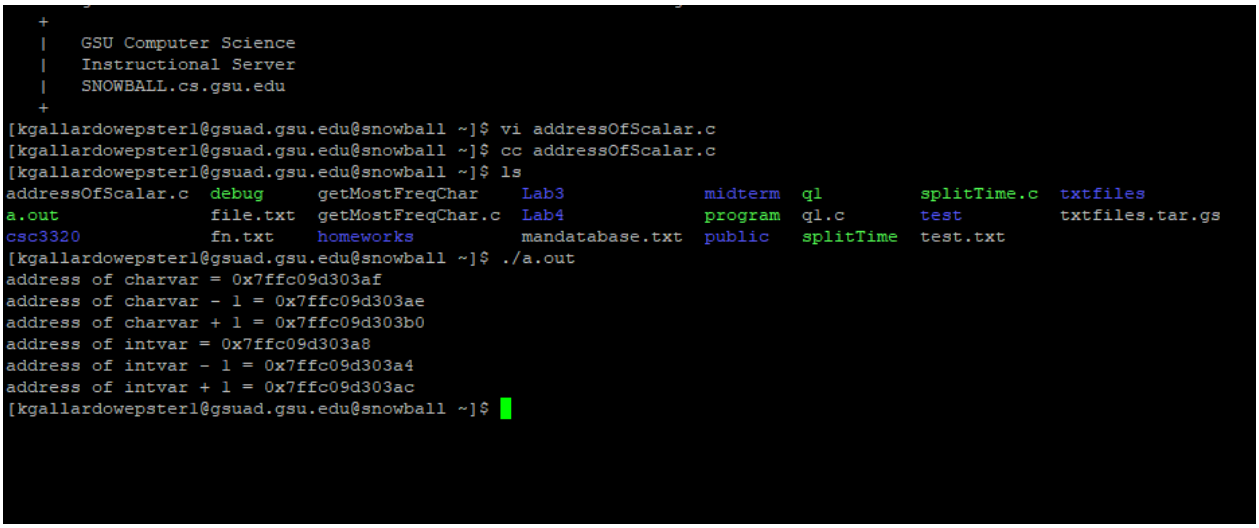


Part 2:

When a variable is stored in memory, it is associated with an address. To obtain the address of a variable, the & operator can be used. For example, &a gets the memory address of variable a. Let's try some examples.
Write a C program addressOfScalar.c by inserting the code below in the main function.

Questions:
1) Run the C program, attach a screenshot of the output in the answer

sheet.



2) Attach the source code in the answer sheet

```
#include <stdio.h>


int main() {
   char charvar = 'a';
   printf("address of charvar = %p\n", (void *)(&charvar));
   printf("address of charvar - 1 = %p\n", (void *)(&charvar - 1));
   printf("address of charvar + 1 = %p\n", (void *)(&charvar + 1));


   int intvar = 1;
   printf("address of intvar = %p\n", (void *)(&intvar));
   printf("address of intvar - 1 = %p\n", (void *)(&intvar - 1));
   printf("address of intvar + 1 = %p\n", (void *)(&intvar + 1));
   return 0;
}
```

2) Then explain why the address after intvar is incremented by 4 bytes instead of 1 byte.

The address after intvar is incremented by 4 bytes because the size of an integer is 4 bytes.

```
1  // intialize a char variable, print its address and the next address
2  char charvar = '\0';
3  printf("address of charvar = %p\n", (void *)(&charvar));
4  printf("address of charvar - 1 = %p\n", (void *)(&charvar - 1));
5  printf("address of charvar + 1 = %p\n", (void *)(&charvar + 1));
6
7  // intialize an int variable, print its address and the next address
8  int intvar = 1;
9  printf("address of intvar = %p\n", (void *)(&intvar));
10 printf("address of intvar - 1 = %p\n", (void *)(&intvar - 1));
11 printf("address of intvar + 1 = %p\n", (void *)(&intvar + 1));
12
```

Part 3:

Write a C program addressOfArray.c by inserting the code below in the main function.

```
// initialize an array of ints
int numbers[5] = {1,2,3,4,5};
int i = 0;

// print the address of the array variable
printf("numbers = %p\n", numbers);

// print addresses of each array index
do {
    printf("numbers[%u] = %p\n", i, (void *)(&numbers[i]));
    i++;
} while(i < 5);

// print the size of the array
printf("sizeof(numbers) = %lu\n", sizeof(numbers));
```

Questions:

1) Run the C program, attach a screenshot of the output in the answer sheet.

```
[kgallardowepsterl@gsuad.gsu.edu@snowball ~]$ cc addressOfArray.c
[kgallardowepsterl@gsuad.gsu.edu@snowball ~]$ ./a.out
numbers = 0x7ffd6129d480
numbers[0] = 0x7ffd6129d480
numbers[1] = 0x7ffd6129d484
numbers[2] = 0x7ffd6129d488
numbers[3] = 0x7ffd6129d48c
numbers[4] = 0x7ffd6129d490
sizeof(numbers) = 20
length(numbers)= 5
```

2) Check the address of the array and the address of the first element in the array. Are they the same?

Address of array : 0x7fff11ae4f20

Address of the first element in the array: 0x7fff11ae4f20

Yes, both addresses are the same.

3) Write down the statement to print out the length of the array by using sizeof

operator.

```
printf("length(numbers)= %lu\n", sizeof(numbers)/sizeof(numbers[0]));
```

Submission:

- Upload an electronic copy (pdf) of your answer sheet to the folder named “Lab 9” in Google Classroom
- Please add the lab assignment number and your name at the top of your answer sheet.
- Upload the C files getMostFreqChar.c, addressOfArray.c and addressOfScalar.c to the folder named named “Lab 9” in Google Classroom
- Name your file in the format of Lab9_ FirstnameLastname (e.g Lab9_FilRondel.pdf)