



Academic year: 2023-2024

Level: 1st year “Computer Science & Mathematics”

Module: Algorithmic and Data Structures 2

TP n°4

Pedagogic objective

- Manipulate pointers in C, pointer arithmetic and addressing the elements of an array;
 - Apply the “malloc” and “free” functions for dynamic memory allocation and release.
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Exercise n°1

Write a C program that uses the notion of pointer to read two integers and calculate their sum.

Exercise n°2

sizeof(T type) function returns the number of bytes necessary to encode, in memory, a dynamic variable of type T.

1. Using this function, write a program that determines the number of bytes occupied by:
 - A character.
 - An integer (short and long).
 - A boolean;
 - A real.
 - The string “1234567”.
2. What do you notice about the size of the string?

Exercise n°3

Consider the following program:

```
main( ){  
int x,y; char a,b ; float f ;  
int *pi1, *pi2;
```

```

char *pc1, *pc2 ;
float *pf1, *pf2;
x=10; y = 9; a='K'; b='S'; f=1.5;
pi1=&x; pi2=& y; pc1=&a; pc2=&b ; pf1=&f; pf2=pf1 ;
printf(" Addresses in hexadecimal: pi1 = %X pi2 = %X \n", pi1, pi2);
printf(" Addresses in decimal: pi1 = %d pi2 = %d \n", pi1, pi2);
printf ("pc1= %d pc2= %d \n", pc1, pc2);
printf ("pf1= %d pf2= %d \n", pf1, pf2);
}

```

1. Write a C program, allowing you to display the result of the following operations:

- a) Increment of pointers pi1, pc1 and pf1;
- b) Decrement of pointers pi1, pc1 and pf1;
- c) Difference between: pi1 and pi2, pc1 and pc2, pf1 and pf2;
- d) Addition of: pi1 and pi2, pc1 and pc2, pf1 and pf2.

2. Which of the above operations are not allowed for pointers.

Exercise n°4

Using the pointer formalism, write a C program that reads two arrays A and B and their dimensions N and M, then adds the elements of B to the end of A.

Exercise n°5

Write a C program that reads an integer X and an array A of type integer and eliminates all occurrences of X in A by packing the remaining elements. The program will use a pointer P1.

Exercise n° 6

Write a C program using pointers that constructs a unitary matrix with dimension N (given by the user).

NB: a unitary matrix is a square matrix whose diagonal elements are equal to 1 and the other elements are zero.