University of Echahid Hamma Lakhdar - El-Oued

Faculty of Exact Sciences
Department of Computer Science

Level: L2 - Module: Algorithms and Data Structures 3

Tutorial N°3: Mastering Pointers in C

Exercise 1: Basic Pointer Manipulation

Write a C program that:

- declares two integer variables,

- declares two pointers to these integers,

- displays the values and addresses of the variables using the pointers.

Objective: Understand the basic concept of pointers and address referencing.

Exercise 2: Pointer as Function Parameter

Write a function:

```
void swap(int *a, int *b);
```

that swaps two integer values using pointers. Test the function in `main()`.

Exercise 3: Pointer as Function Return Value

Write a function:

```
int *max_ptr(int *a, int *b);
```

that returns a pointer to the largest value among the two integers. Display the maximum value using the returned pointer.

Exercise 4: Pointers and Arrays

Write a program that:

- reads 10 integers into an array,

- uses a pointer to display all elements of the array,

- computes and prints the sum and average of the array elements.

Exercise 5: Pointer and Strings

Write a function:

```
int count_vowels(char *str);
```

that counts the number of vowels in a string using a pointer. Test the function in the `main()` program.

Exercise 6: Recursive Function with Pointer

Write a recursive function:

```
int sum_array(int *arr, int n);
```

that computes the sum of all elements of an array using recursion and pointers.

Exercise 7: Pointers to Functions

Write a program that:

- defines a function `int add(int a, int b);` that adds two integers,

- declares a pointer to function: `int (*fptr)(int, int);`,

- assigns the address of `add` to `fptr` and calls it through the pointer.

Exercise 8: Dynamic Memory Allocation

Write a C program that:

- asks the user to enter the size of an array,

- dynamically allocates memory using `malloc()`,

- fills the array with integers,

- prints the array contents using a pointer,

- then frees the allocated memory.

Exercise 9: Recursive Function with Dynamic Allocation

Write a program that:

- dynamically allocates an array of integers,

- fills it with random values between 1 and 100,

- uses a recursive function with a pointer to find the maximum element of the array.