PROFESSIONAL TRAINING INSTITUTE

Assignment - X

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Assignment VII Pointer

In this section we are going to discuss about pointer. Before that discuss something about memory, runtime and compile time.

As name suggest compile time means action during compile time and run time means action during runtime.

When compiler take any C file, it reads line by line, top to bottom. During compile time generate the source code for the program. To that Source code execution time is called run time. Execution in the sense does anything varying and uncontrolled. In below example let see which the runtime is and compile time,

Example;

```
 Int main(void)
{
Int x;
Int y=20;       // won't generate the source code(compile time)
 x=30;          // generate the source code(runtime)
....    }
```

During compile time source code won't be generate for macro.

Do you know what one byte of memory is?

Let see, one byte of memory means for addressing any byte (0 of 255 bytes) required one byte. But it should be in anywhere in the memory. Let see in this for addressing any byte in memory it required one byte of memory. Then consider as two bytes of memory you want to address, for that it required two bytes of memory. If you are thinking it is occupied only one memory means wrong because in 2 bytes of memory address it should start from the 0000. Consider in the program you may declare an integer variable (eg: int a). Obviously 4 bytes of memory it should be occupied, but it must be continuous. For this 4 bytes of memory initial address is enough no need to mention remaining all addresses.

We should remember anywhere in pointer address and the value both are different. Whenever we read the value we should have addressed.

For example, in your college library, laboratory, classrooms is there, it should have a separate address for each. Consider now your class teacher gave one task 'To take a book from library'. She gave the address of library and book name too, so what you people will do? Directly go to the library search the particular book where is it placed? Then reach to that particular address then took that book.

In this book is a value, library is a memory, book place is an address. Important thing is in that place any different books can be placed, but place address should not be change. So in an address can assign a different values.

Let see what is pointer and how to declare

A pointer is a variable whose value is the address of another variable, i.e., direct address of the memory location. Like any variable or constant, you must declare a pointer before using it to store any variable address. The general form of a pointer variable declaration is

Type * pointer variable name;

Eg:
Int a;
Int *ptr:

Ptr is an pointer variable, which is holding the value of variable a. After declaring a pointer variable. Here, type is the pointer base type; it must be a valid C data type and variable name is the name of the pointer variable which is called as dereference. The asterisk * used to declare a pointer is the same asterisk used for multiplication. However, in this statement the dereference is being used to designate a variable as a pointer. Take a look at some of the valid pointer declarations −

```
   int    *ip;    /* pointer to an integer */
double *dp;    /*pointer to a double */
float  *fp;    /* pointer to a float */
char   *ch                          /* pointer to a character*/
```

The actual data type of the value of all pointers, whether integer, float, character, or otherwise, is the same, a long hexadecimal number that represents a memory address.

How to Use Pointers?

There are a few important operations, which we will do with the help of pointers very frequently.

Step 1: We define a pointer variable (dereference),
Step 2: assign the address of a variable to a pointer and
Step 3: finally access the value at the address available in the pointer variable.
This is done by using dereference returns the value of the variable located at the address.

Eg:

```
int b:
int  *ptr;
ptr=&b;
```

If you are using many values can declare different variables for each, that to allocate different addresses. But it may be continuous or may not be. In a cause created array, it should be consenting the memory. then assigning the address of the variable to the pointer variable. But it should be pointer variable, otherwise can't dereference it. We should remember anywhere in pointer address and the value both are different. Whenever we read the value we should have addressed.

For example, (we can refer a above example for this)

Same as here also, the library is a memory, the book is a data (value), that book place is the addressing. Important thing is in that place any different books can be placed, but place address should not be change. So in a address can assign a different values. After assigning variable and pointer variable, then assign the variable address to the pointer. This pointer dereference the value.

The pointer variable and variable is totally different. The pointer variable is holding the address of a variable. The variable is holding the value.

1. **Example programs:**

a. Declare int, char variable (variable name as a and b),and 2 pointer variable for respected data types. Assign the address. Print the value of a, &a, aptr, *aptr, &aptr , b, &b, &bptr, *bptr.
b. Declare in array of size(5) assign its address to integer pointer using pointer, initialize array and pointer array.
c. Print your name using pointer. Print the address of each element of your name.
d. Addition, sub, mul div of two numbers using pointer.
e. Find the average of 5 given numbers, 10, 20, 30, 40 and 50, using pointers.
f. Swap two given numbers using pointers.
g. Write a program to take your name as input save into another array using pointer.
h. Find out how many vowels are there in name, using pointers.
i. Pass two strings into a function ex, (Embedded and system) after merging return the one string to the main function and print the result.
j. Write a c program of addition of two numbers using function. Function should receive two arguments as a pointer and calculate the sum using pointer and return the integer value to the function where it called.
k. write a program to subtract two numbers using function .Pass one argument as integer pointer and another as integer. Return the integer pointer to the main function.
l. Find the average of 5 numbers. Numbers to be saved into array using pointer and average calculation has to be done into an average function where we have to pass the address of array. The function average will return the integer pointer using pointer print the result in the main function.
m. Pass two char array as the size of same size into a function using pointer. In the function write a program to compare both array and return the 0 or 1.If they are same return 1 and if they are not same return 0.
n. In a program write a function where pass integer variable as input having value 0X11223344.while receiving into a function receive as a character pointer. Using char pointer print the value of integer.
o. Declare array of character pointer initialize them and print them.

2. Theory question need to clear
    a. What is the pointer?
    b. What is call by reference and call by value?
    c. What is the difference between *ptr and &ptr?
    d. What is int const *ptr, const int * ptr, const const int * ptr;
    e. What is double pointer, triple pointer? How to dereference double pointer?
    f. What is near pointer, far pointer, huge pointer?
    g. How many bytes char pointer take into memory, how many byte integer pointer take into memory?
    h. What is the size of void pointer?
    i. What is the difference between null pointer and void pointer?
    j. const int a; int const a; const int *a; int * const a; int const * a const;
    k.

Understand pointer with full depth, as many question will be appear in written and interview.