Programming Lab Report

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[010243107] C Programming 2023

Lab Week 8

Pointer

Topic

- Array pointer
- Variable pointer

Experiment I

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1 Problem description

- Write a program that stores your age in a variable and declare a pointer and let the pointer points to the variable.
- Then, print address and value of the variable and of the pointer and verify that the pointer points to the variable correctly.

2 Program design

- The pointer is like container that contain variable address. When change value in pointer, the value of variable that in the pointer will change to.
- For create the pointer, we use '*' to make that variable is pointer.
- For pointing the pointer, we will use [pointer] = &[variable] to get the address of the variable.
- For output the address, we use '%p' to output the address variable and use '&' for output the address the pointer.

3 Program text

```c
#include <stdio.h>

int age = 19;
int *pointer;

int main(){
    pointer = &age;
    printf("Age (in age): %d\nAge (in pointer): %d\nAddress age: %p\nCompare adress
        between variable and pointer: %d",age,*pointer,pointer, &age==pointer);
}
```

4 Terminal output

```
Age (in age): 19
Age (in pointer): 19
Address age: 00007ff75f122010
Compare adress between variable and pointer: 1
```

Experiment II

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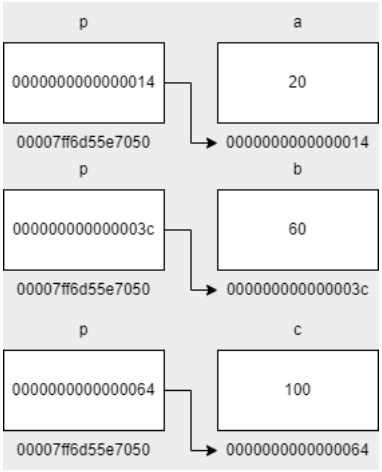
1 Problem description

- Write a program that has variables a, b, and c (all are integer) and pointer p. Then, do the followings:

  1. Let p points to a and set value of a to 20.
  2. Let p points to b and set value of b to 60.
  3. Let p points to c and set value of c to 100.
  4. Modify value of a to 50 by using pointer p.
  5. Declare pointer q and change value of c to 80 by using q.
  6. Modify value of a to 500 by using pointer q.
  7. Print value of a, b, c, p, and q and draw a figure to show the final result.

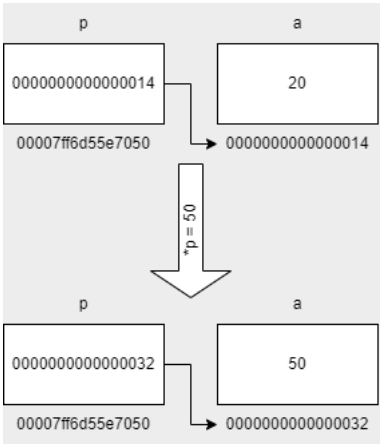
2 Program design

- In this experiment, we have to insert value into a, b and c.
- When create variable that doesn't contain the value, the address will be '0000000000000000'.
- When we point the variable and change the value, the address of that variable will change as see in the diagram below.

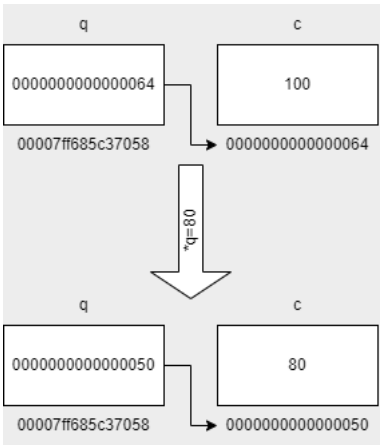


- Then we point p to a and change value to 50.

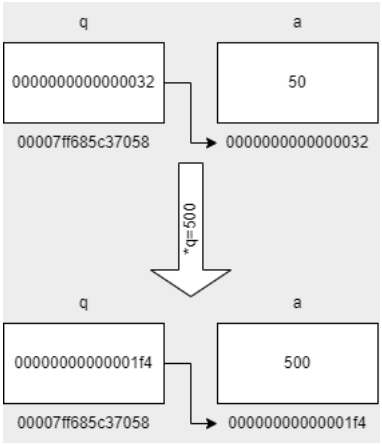
The diagram is on the next page



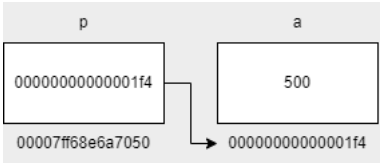
- Then we point q to c and change value to 80.



- Then we point q to a and change value to 500.



- When we check p value, the value will be same as q because they link to same address.



3 Program text

```c
#include <stdio.h>

int a, b, c;
int *p, *q;

int main(){
    printf("Adress\n");
    printf("a: %p\nb: %p\nc: %p\np: %p\nq: %p\n\n",a,b,c,&p,&q);
    p = &a;
    *p = 20;
    p = &b;
    *p = 60;
    p = &c;
    *p = 100;
    printf("(a,b,c) = (%d,%d,%d)\n",a,b,c);
    printf("Adress\n");
    printf("a: %p\nb: %p\nc: %p\np: %p\nq: %p\n\n",a,b,c,&p,&q);

    p = &a;
    *p = 50;
    q = &c;
    *q = 80;
    q = &a;
    *q = 500;

    printf("(a,b,c,p,q) = (%d,%d,%d,%d,%d)\n",a,b,c,*p,*q);
    printf("Adress\n");
    printf("a: %p\nb: %p\nc: %p\np: %p\nq: %p\n\n",a,b,c,&p,&q);
}
```

Part 4: Terminal output is on the next page.

4 Terminal output

```
Adress
a: 0000000000000000
b: 0000000000000000
c: 0000000000000000
p: 00007ff7cd1f7050
q: 00007ff7cd1f7058

(a,b,c) = (20,60,100)
Adress
a: 0000000000000014
b: 000000000000003c
c: 0000000000000064
p: 00007ff7cd1f7050
q: 00007ff7cd1f7058

(a,b,c,p,q) = (500,60,80,500,500)
Adress
a: 00000000000001f4
b: 000000000000003c
c: 0000000000000050
p: 00007ff7cd1f7050
q: 00007ff7cd1f7058
```

Experiment III

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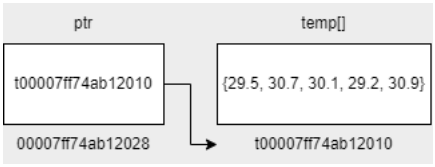
1 Problem description

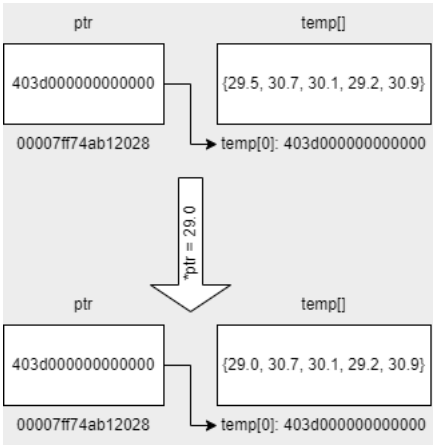
- Write a program that store temperature of 5 days (29.5, 30.7, 30.1, 29.2, 30.9). Declare a pointer and do the followings:
  1. Let the pointer points to the first value in the array.
  2. Modify the first temperature value from 29.5 to 29.0 by using the pointer.
  3. Modify the third temperature value from 30.1 to 30.0 by using the pointer and without moving the pointer.
  4. Move the pointer to the last value in the array
  5. Modify the fourth temperature value from 29.2 to 29.3.
  6. Print the array and the pointer value and draw a figure to show the final result.

2 Program design

- In this experiment, we can use pointer to point the index of the array.
- When we point the pointer to array, it will point to index 0 first. (In diagram will show pointer connect to array address)

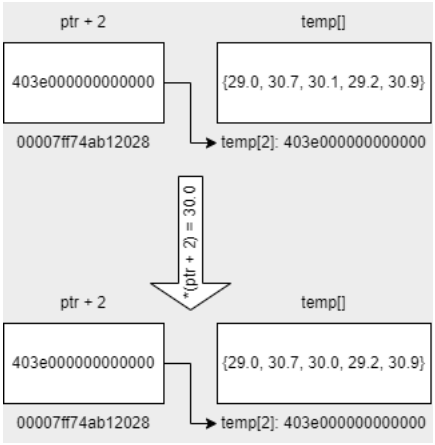


- Then we point ptr to index 0 and change value to 29.0.

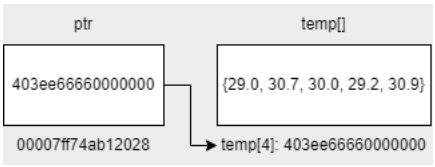


Part 2: Program design (continue) is on the next page

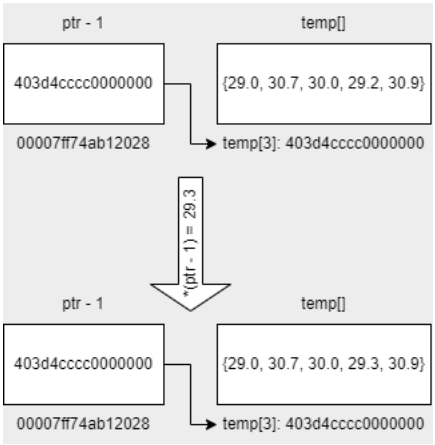
- Then we point ptr to index 2 by + index to ptr and change value to 30.0.



- Then we point ptr to index 4 aka. last value of the array.



- Then we point ptr to index 3 by -index of ptr by 1 and change value to 29.3



Part 3: Program text is on the next page.

3 Program text

```c
#include <stdio.h>

const int length = 5;
float temp[] = {29.5, 30.7, 30.1, 29.2, 30.9};
float *ptr  = temp;
int i;

void PrintList(float list[], int length){
    for (i = 0; i < length; i++){
        printf("%.1f\n",list[i]);
    }
}

void AddressListIndex(float list[],int length){
    for (i = 0; i < length; i++){
        printf("temp[%d]: %p\n",i,list[i]);
    }
}

int main(){
    *ptr = 29.0;
    *(ptr + 2) = 30.0;
    ptr = &temp[4];
    *(ptr - 1) = 29.3;
    PrintList(temp,length);
    printf("Pointer value: %.1f\n", *ptr);
    printf("Adress\n");
    printf("temp[]: %p\n",temp);
    AddressListIndex(temp,length);
    printf("ptr: %p",&ptr);
}
```

4 Terminal output

```
29.0
30.7
30.0
29.3
30.9
Pointer value: 30.9
Adress
temp[]: 00007ff7614c2010
temp[0]: 403d000000000000
temp[1]: 403eb33340000000
temp[2]: 403e000000000000
temp[3]: 403d4cccc0000000
temp[4]: 403ee66660000000
ptr: 00007ff7614c2028
```

Experiment IV

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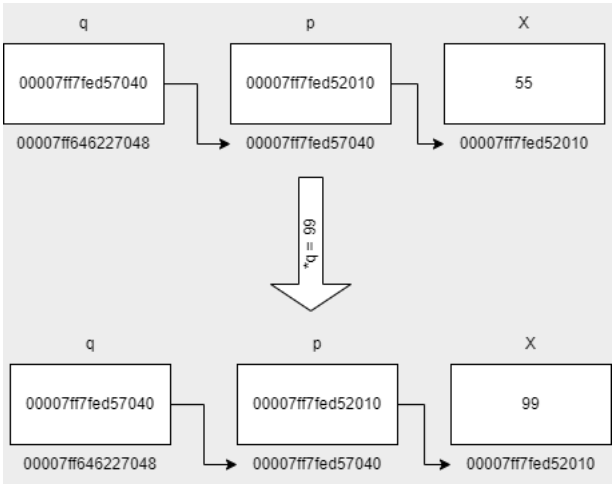
1 Problem description

- Write a program that store 55 in variable x and do the followings:
  1. Let pointer p points to x.
  2. Let pointer q points to p.
  3. Modify value of x to 99 by using pointer q.
  4. Move the pointer to the last value in the array
  5. Modify the fourth temperature value from 29.2 to 29.3.
  6. Print value of variables and draw a figure to verify your program.

2 Program design

- In this experiment, there are pointer and double pointer.
- For creating double pointer, we use '**' instead of using '*'.
- For point double pointer to pointer, we will use same method then we point the pointer to variable.
- When we want to change value from double pointer, we will use '**' instead of using '*'.
- So, we point double pointer to pointer to x and change value to 99.



Part 3: Program text is on the next page.

3 Program text

```c
#include <stdio.h>

int x=55;
int *p,**q;

int main(){
    p = &x;
    q = &p;
    **q = 99;
    printf("Address\nx: %p\np: %p\nq: %p\n",p,&p,&q);
    printf("x = %d",x);
}
```

4 Terminal output

```
Address
x: 00007ff7804a2010
p: 00007ff7804a7040
q: 00007ff7804a7048
x = 99
```

End of Lab Experiment Week 8