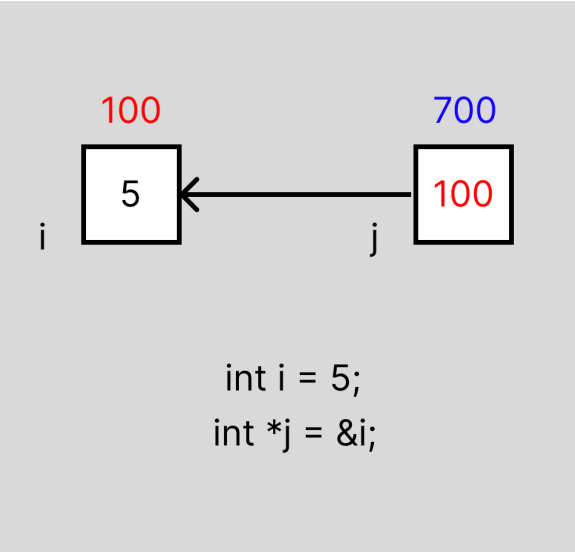
Pointers

Definition of Pointers in C++

In C++, a pointer is a variable that stores the memory address of another variable. It allows direct manipulation of the memory location where the data is stored. Pointers are commonly used for dynamic memory allocation, passing parameters by reference, and accessing data structures like arrays and linked lists.



First we created a int type block of memory and assigned the value ‘‘5’’ to it and has some address “100”;

Then we created a pointer j assigning the address of i which stores the address of “i” that is 100;

When we want to print the value we use the following syntax:

```
cout<<*j<<endl; //or
cout<<i<<endl;
```

Example:

Example of a pointer in C++

```
int num = 5;
int* ptr = &num;

// Accessing the value using the pointer
cout << "Value of num: " << *ptr << endl;
```

Use of Pointers in Arrays

Example:

```
int arr[] = {1,8,4,6,88,99,23};

    cout<<"\n";
    cout<<"\n";
    cout<<"\n";
    cout<<"\n";
    cout<<"Address of first element of array: "<<arr<<endl;
    cout<<"Value of first element of array: "<<arr[0]<<endl;
    cout<<"Address of first element of array using &: "<<&arr
[0]<<endl;
    cout<<"Value of first element of array using '*': "<<*arr
<<endl;
    cout<<"Value of first element of array using '*' (arr[0]+
1): "<<*arr+1<<endl;
    cout<<"Value of first element of array using '*' (arr
[1]): "<<*(arr+1)<<endl;

    int i = 3;
    cout<<"This way we can print value of 3rd element in arra
y 'interator': "<<i[arr]
<<endl;
    cout<<"This way we can print value of 3rd element in arra
y 'index': "<<arr[i]<<endl;
```

```
    //arr[i] == *(arr+i)
    //breakdown
    /*
        arr[3]
        *(arr+i)
        *arr = 0th position
        *(arr+i) = *(0+3) = *(3) = 3th position
        points address at 3rd index of array
    */

    cout<<"Value of ith element: "<<arr[i]<< " Value at (arr+
i)th index: " <<*(arr+i)
<<endl;

    int arr1[10];

    cout<< "size of arr1: "<<sizeof(arr1)<<endl;
    int *ptr = &arr1[0];
    cout << "size of ptr: "<<sizeof(ptr)<<endl;
```

Use of Pointers in Strings

Example:

```
const char* str = "Hello, World!";
cout << str << endl;

// Accessing individual characters using a pointer
const char* ptr = str;
while (*ptr != '\\0') {
    cout << *ptr;
    ptr++;
```

```
}
cout << endl;
```

Double Pointers

Example:

```
#include<iostream>
using namespace std;

void update(int **p2){
    **p2= **p2+1;
}

int main()

{

    int value = 5;
    int *p = &value;
    int **p2 = &p;

   // cout<<p<<endl; //prints the address of the value
   // cout<<&p<<endl; //prints the address of p
   // cout<<&p2<<endl; //prints the address of p2

    cout<<"Before: "<<endl;
    cout<<value<<endl; //5
    cout<<p<<endl;     //0x904edff864
    cout<<p2<<endl;    //0x904edff858

    update(p2);
     cout<<"After: "<<endl;
```

```
    cout<<value<<endl; //6
    cout<<p<<endl;     //0x904edff864
    cout<<p2<<endl;    //0x904edff858


    return 0;
}
```