Advanced Programming using C++

فرشاد حکیم پور

Defining Array Length at Run-time

- The following code *may* cause a compilation error:

```
int arraySize;
std::cin >> arraySize;
int myArray [arraySize];
```


Size of an Array

- Finding the size of an array at run-time

```
int arraySize;
std::cin >> arraySize;
int myArray [arraySize];
std::cout << sizeOf(myArray)/ sizeOf(int) << endl;
sort(myArray);
```


Size of an Array

- Finding the size of an array at run-time

```
sort(int myArray[])
{
   std::cout << sizeof(myArray) << std::endl;
   // output: 4
   . . .
}
```

- You must always pass the size of the array to your function as a separate parameter

Passing Arrays to Functions

Pass by reference

Pass by value

```
void test(int b[], int q)
{
   b[1] = 1000;
   q=3000;
}
int main()
{
   int a[] = {0,1,2};
   int p = 3;
   test (a, p);
   std::cout << a[1] << ", " << p << std::endl;
   // output: 1000, 3
}
```


Variable Length Array

- Amount of memory consumed by a variable length array varies during run-time
- Normal arrays cannot change in size during run-time
- C++ standard library provides *vector* type for this purpose

C++ Vectors

- In Standard C++ code use the vector class (from Standard Tamplate Library)
- Vectors have more features compared to arrays

```
#include <vector>
using std::vector;
. . .
Vector<char> name;
vector<double> xList;
vector<double> yList;
```

Type of the array

C++ Vectors

- You can use vectors just like arrays

```
// size 2, init by 0
vector<double> xList (2, 0);
xList[0] = 20;
xList[2] = 20;    // No error

xList.at(0) = 20;
xList.at(2) = 20; // Run-time error
```


C++ Vectors

- You can change the size of C++ vectors in run-time (dynamically)

```
vector<double> xList (2, 0);
cout << xlist.size() << endl;// output: 2
xlist.push_back(100);
cout << xlist.size() << endl;// output: 3
cout << xlist[2] << endl;    // output: 100
cout << xlist.at(2) << endl; // output: 100
```


Exercise

- What does capacity function do in vector class?
- Find out how you can reduce the size of a vector.
- What does erase function do in vector class?
- You can check: “http://www.cplusplus.com/reference” for help