Assignment-No-11

Name :→ Sameer Manoj Bramhecha
Roll No :→ 21115
Batch :→ E-1
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Title :→ Item Record system using sorting and searching for STL and vector container.

Problem Statement :→
Write a C++ program using STL for sorting and searching user defined records such as Item records (Item code, name, cost, quantity, etc) using vector container.

Learning Objectives: -
To learn the concept of STL, searching, sorting and vector container.

Learning Outcomes: -
After completion of this assignment, students will be able to implement the concept of STL and vector container.

S/W and H/W requirements :→
1.> 64-bit open source windows.
2.> Open source C++ programming tool like G++/Gcc.

Theory :→

STL :→ The Standard Template Library (STL) is a set of C++ template classes to provide common programming data structures and functions such as lists, stacks, array, etc. It is a library of container classes, algorithms and iterators. It is a generalized library and so, its components are parameterized.

STL has 4 components :

1) Algorithms :→ The algorithms are used to process the contents of the containers. The functionalities provided in container are not sufficient to perform complex operations hence the algorithms are used to support more complex operations for the containers.

2) Containers :→ The container is a collection of objects of different types. These objects store the data. The container can be implemented using template classes. There are two types of containers :

(1) Sequence container :— Implement data structures which can be accessed in a sequential manner.
eg :→ vector, list, deque, arrays, etc.

(2) Associative containers :— Implement sorted data structures that can be quickly searched.
eg :— set, multiset, map & multimap, etc.

3.> Functions:→ The STL includes classes that overload the function call operator. Instances of such classes are called function objects or functors. Functors allow the working of the associated function to be customized with the help of parameters to be passed.

4.> Iterators:→ The iterators are basically objects but sometimes they can be pointers and hence iterators specify the positions in container. The iterators are used to traverse the contents of container.

• Sorting:→
It is one of the most basic functions applied to data. It means arranging the data in a particular fashion, which can be increasing or decreasing. There is a built-in function in C++ STL by the name of sort(). This function internally uses Intro Sort. In more details it is implemented using hybrid of Quick Sort, Heap Sort and Insertion sort. By default, it uses Quick sort, but if Quick sort is doing unfair partioning, and taking more than N*logN time, it switches to Heap sort and when the array size becomes really small, it switches to Insertion Sort.

Syntax:—
sort (start_address, end_address)
→ start_address → the address of first element of array.
→ end_address → the address of the next contiguous location of the last element of array.

4. Searching :→
Find() is used for searching an element in a vector. It returns an iterator to the first element in the range [first, last) that compares equal to value to be searched. If no such element is found, the function returns last.

Algorithm :→

1. Start
2. Include Header files such as: iostream, stdlib.h, vector, algorithm and string.
3. Define class 'ItemRecord'
4. In public section, initialize variables, item_name, item_code, cost and quantity.
5. Overload == operator such that if 2 item codes match, it returns 1 or else returns 0.
6. Overload < operator such that it returns 1 if i1.itemcode > i2.itemcode. else returns 0.
7. Outside class, define vector of class ItemRecord.
8.) Define insert() function, which accepts item_name, item_code, cost and quantity from user and puts it in container.
9. Define display() function which displays Records for each item. using for_each() function.
10. Define print() function which is linked to display() to print Records one by one.
11. Define & search(), and accept code of item to be found. using find() and iterator search the item record.

(12) Define dlt() function, and accept item_code to be deleted. Using find() and iterator search the item and using erase() delete it.

(13.) In main(), create an object of class.
(14) Display menu and accept users choice.
(15.) Based on choice of user, call respective function.
(16) Stop.

Test Case :-

① Insertion of records & Display

Input:	Expected output
item_name = Mouse	Item Name : Mouse
item_code = 10001	Item Code : 10001
cost = 1000	Item Cost : 1000
quantity = 100	Item Quantity : 100

Actual Output:

Item Name : Mouse
Item Code : 10001
Item Cost : 1000
Item Quantity : 100.

Test Case Passed.

② Searching of records and Sorting :-

Input:

item_name = Mouse	item_name = PenDrive
item_code = 10001	item_code = 10002
item_cost = 1000	cost = 10
quantity = 100	quantity = 1000.

Expected output	Actual Output.
Found	Found
Item Name: PenDrive	Item Name: PenDrive
Item code: 10002	Item code: 10002
Item cost: 10	Item cost: 10
Item Quantity: 1000	Item Quantity: 1000
Item Name: Mouse	Item Name: Mouse
Item code: 10001	Item code: 10001
Item cost: 1000	Item cost: 1000
Item Quantity: 100.	Item Quantity: 100.

Test case 2 Passed.

Conclusion.

Hence we have successfully studied the concept of STL and how it makes data structures easier.