

Assignment - 11 (OOPS)

Roll No. 21123

Batch - F1.

Div. SEI

DOP:

DOS:

- # Title: Personal Information System using sorting and searching for STL and vector containers.
- # Problem statement . Write C++ program using STL for sorting and searching user defined records such as personal records (Name, DOB, Telephone) etc. using vector containers.
- # Objective - To learn concept STL, searching , sorting and vector containers.

Theory -

STL: The standard Template library(STL) is set of C++ template classes to provide common programming data structures and function such as list, stack, arrays, etc.

It is library of containers, classes, algorithm and iterators.

It is generalized library and so, its components are parametrized . A working knowledge of template classes is prerequisite for working with STL.

STL has four components .

1) Algorithm

2) Containers

3) Functions

4) Iterators

Algorithm: It defines collection of function especially designed to be used on ranges of elements. They act on containers and provide means for various operations for contents of containers.

Algorithm - sorting, searching, important STL Algorithm, useful array algorithm, partition operations, Numeric

Containers: It stores objects and data. There are in total seven standard "first class" containers classes and three containers adaptor classes and only seven header files that provide access to container or container adaptor.

Sequence containers: Implement data structure which can be accessed in sequential manner

vector

list

deque

arrays

Forward-list

Container Adaptor: provide different interface for sequential containers:

queue

priority-queue & stack.

Associative containers: Implemented sorted data structures that can be quickly searched ($O(\log n)$) complexity.

Set

multiset

map

multimap.

Unordered Associative containers: Implement unordered data structures that can be quickly searched.

Set unordered_set
Multi-set

Unordered Associative containers: Implement unordered data structure that can be quickly searched.

unordered_set
unordered_multiset
unordered_map
unordered_multimap

Function:

The STL function includes classes that overloaded fn call operators. Instances of such classes are called fn objects or functors. Functors allow working of associated functions to be customized with help of parameters to be passed.

Iterators: An iterator is an object (like a pointer) that points to an element in a container. We can use iterators to move through the contents of containers.

Utility library;

Defined in header <utility>
pair

Sorting: It is one of most basic functions applied to data. It means arranging data in particular fashion which can be increasing or decreasing. There is built-in function in it STL by name of sort(). This function internally uses IntroSort. In more details it is implemented using hybrid of quick sort, Heapsort and insertion sort. By default, it

prob

uses quick sort is doing unfair partitioning and taking more than N^2 time, it switches to heapsort and when array size becomes really small, it switches to insertion sort - Prototype for sort is

sort (start address, end address)

start address : the address of first element of array

end address : address of next contiguous location of last element so actually sort() sorts in range of [startaddress, endaddress]

searching: It is widely used searching algorithm that requires the array to be sorted before search is applied. The main idea behind this algorithm is to keep dividing array in half (divide & conquer) until element is found or all elements are exhausted.

It works by comparing middle item of array with our target if it matches it return true otherwise if middle term is greater than target, search is performed in left sub-array. If middle term is less than target, search is performed in right sub-array.

Algorithm.

- 1) Start.
- 2) Give header file to use vector.
- 3) Create class statement naming "student"
- 4) Initialize variable to store name, dob, & telephone number
- 5) Using iterator store as many records you want to store using predefined functions as push_back().
- 6) Using iterator and predefined functions store data.
- 7) Using predefined function sort(), sort data stored according to user requirements.
- 8) Using predefined function search, search element from vector user wants to check.
- 9) Display and call Fⁿ using a menu.
- 10) End.

Conclusion:

Hence, we have successfully studied concept of STL and how it makes data structures easy. It briefs about predefined functions of STL and their uses such as search() & sort().