Programming Assignment 1

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CSCE 221 - 504

(a) **Program Description:**
In this program, includes a class called My_vec which stores chars that can be inserted, removed, or replaced. Other functions include constructors and decontructors that assist pointers to allocate size and capacity for the My_vec class. A generic version of this My_vec is written in template form for the use in incorporating different data types in the My_vec class.

(b) **Data Structure Description and ADT Run-time**

- **Theoretical definition**
  Abstract Data Type (ADT) specifies the type of data that is stored in the operations that support the data. The main feature of ADT is a clear description of the input to each operation, the action of each operation, and its return type.
- **Real implementation:**
  To implement a real ADT Run-time, a char type vector class was implemented to do different kinds of operations on a vector. A generic version of the char type vector class was created through a template for the availablity to incorporate different data types. Both versions of the vector class included the functions - element_at_rank(), insert_at_rank(), constructor, copy constructor, destructor, assignment operator, overloading [] and ¡¡ operators, find_max_index, sort_max, remove_at_rank(), and replace_at_rank().
- **Analysis of best and worst scenarios for vector:**
  The best scenario that comes from this vector class type is that it can do differnet operations and store different data types.

  The worst scenario that comes from this vector class type is that a concatenation function was not implemented for the vector class.

(c) **Instructions to Compile and Run Program:**
Change director to folder typing cd <foldername>.
Run program typing ./main

The program is programmed in the main without needing any user input. The program itself is already made into two object files (My_vec.o and main.o) that together output the given vector information with function implementations mentioned above under Real implementations.

(d) **Logical Exceptions (And bug description):**
When the users try to access an element that does not exsist in the vector, the compiler will output an "out of range" error message to the user. The insert_at_rank() is an exception since if the rank input is larger than the size, the size of the vector will be increased +1 of the rank value.
A bug involved in the code resulted when the size of the vector was expanded to include a data type at a certain rank. Two random characters, specifically for char, would take space within the vector.

(e) **C++ object oriented or generic programming features, C++11 features:**
The My_vec class is object orientated programming.
The generic programming is under the My_vec.h file in the Template folder which implements a generic vector that can hold any type of data.
The C++ 11 feature is in the Char folder implemented in another cpp file (My_vec.cpp). Auto was used to initialize the variable i.

(f) **Testing results:**

Char Type Vector Test.

[rawrbyte]@sun /CSCE221/lab1/Char¿ (22:32:49 09/09/15)
:: ./main
————————- CHAR TEST ————————-
insert 'B' at the rank 0 into the vector v
B
Size of vector: 1
insert 'A' at the rank 0 into the vector v
A B
Size of vector: 2
insert 'D' at the rank 10 into the vector v
A B 8 0 0 0 0 0 0 0 D
Size of vector: 11
remove a character at the rank 2 from the vector v
A B 0 0 0 0 0 0 0 D
Size of vector: 10
replace a character at the rank 2 by the character 'E'
A B E 0 0 0 0 0 0 D
Size of vector: 10
create a copy v1 of the vector v using a copy constructor
A B E 0 0 0 0 0 0 D
replace a character at the rank 2 of the vector v1 with the character 'Y'
A B Y 0 0 0 0 0 0 D
insert 'K' at the rank 0 into the vector v2
K
Size of vector: 1
test the assignment operator and copy the vector v1 to v2

A B Y 0 0 0 0 0 0 D
Size of vector: 10
test the function find_max_index using v2
Y
test the function sort_max using v2
0 0 0 0 0 0 A B D Y
replace in the vector v2 a character at the rank 14 with 'S'
Out of range

Generic Type Vector Test.

————————- CHAR TEST ————————-
insert 'B' at the rank 0 into the vector v
B
Size of vector: 1
insert 'A' at the rank 0 into the vector v
A B
Size of vector: 2
insert 'D' at the rank 10 into the vector v
A B 8 0 0 0 0 0 0 0 D
Size of vector: 11
remove a character at the rank 2 from the vector v
A B 0 0 0 0 0 0 0 D
Size of vector: 10
replace a character at the rank 2 by the character 'E'
A B E 0 0 0 0 0 0 D
Size of vector: 10
create a copy v1 of the vector v using a copy constructor
A B E 0 0 0 0 0 0 D
replace a character at the rank 2 of the vector v1 with the character 'Y'
A B Y 0 0 0 0 0 0 D
insert 'K' at the rank 0 into the vector v2
K
Size of vector: 1
test the assignment operator and copy the vector v1 to v2
A B Y 0 0 0 0 0 0 D
Size of vector: 10
test the function find_max_index using v2
Y
test the function sort_max using v2
0 0 0 0 0 0 A B D Y
replace in the vector v2 a character at the rank 14 with 'S'
Out of range
————————- INT TEST ————————-
insert 3 at the rank 0 into the vector a
3
Size of vector: 1

insert 6 at the rank 0 into the vector a
6 3
Size of vector: 2
insert 7 at the rank 10 into the vector a
6 3 0 0 0 0 0 0 0 0 7
Size of vector: 11
remove a integer at the rank 2 from the vector a
6 3 0 0 0 0 0 0 0 7
Size of vector: 10
replace a character at the rank 2 by the integer 1
6 3 1 0 0 0 0 0 0 7
Size of vector: 10
create a copy a1 of the vector a using a copy constructor
6 3 1 0 0 0 0 0 0 7
replace a number at the rank 2 of the vector a1 with the number 5
6 3 5 0 0 0 0 0 0 7
insert 2 at the rank 0 into the vector a2
2
Size of vector: 1
test the assignment operator and copy the vector a1 to a2
6 3 5 0 0 0 0 0 0 7
Size of vector: 10
test the function find_max_index using a2
7
test the function sort_max using a2
0 0 0 0 0 0 3 5 6 7
replace in the vector a2 a number at the rank 14 with 8
Out of range
————————- FLOAT TEST ————————-
insert 5.56 at the rank 2 into the vector b
0 0 5.56
Size of vector: 3
insert 6.626 at the rank 4 into the vector b
0 0 5.56 0 6.626
Size of vector: 5
insert 1.13 at the rank 12 into the vector b
0 0 5.56 0 6.626 0 0 0 0 0 0 0 1.13
Size of vector: 13
remove a float at the rank 3 from the vector b
0 0 5.56 6.626 0 0 0 0 0 0 0 1.13
Size of vector: 12
replace a float at the rank 2 by the float 11.56
0 0 11.56 6.626 0 0 0 0 0 0 0 1.13
Size of vector: 12
create a copy b1 of the vector b using a copy constructor
0 0 11.56 6.626 0 0 0 0 0 0 0 1.13

replace a float at the rank 5 of the vector b1 with the float 5.22
0 0 11.56 6.626 0 5.22 0 0 0 0 0 1.13
insert 2.23 at the rank 0 into the vector b2
2.23
Size of vector: 1
test the assignment operator and copy the vector b1 to b2
0 0 11.56 6.626 0 5.22 0 0 0 0 0 1.13
Size of vector: 12
test the function find_max_index using b2
11.56
test the function sort_max using b2
0 0 0 0 0 0 0 0 1.13 5.22 6.626 11.56
replace in the vector b2 a float at the rank 14 with 8.96
Out of range