CSCE 221 Cover Page
Programming Assignment #1
Due July 11 by midnight to eCampus

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Please list all sources in the table below including web pages which you used to solve or implement the current homework. If you fail to cite sources you can get a lower number of points or even zero, read more: Aggie Honor System Office

Type of sources	Stack Overflow
People	
Web pages (provide URL)	https://stackoverflow.com/questions/5368258/the-copy-constructor-and https://stackoverflow.com/questions/4700991/c-implementing-copy-constructor-
Printed material	
Other Sources	

I certify that I have listed all the sources that I used to develop the solutions/codes to the submitted work.

"On my honor as an Aggie, I have neither given nor received any unauthorized help on this academic work."

Your Name Jonathan Westerfield Date 7/9/2017

Program Description:

This assignment implements a homemade vector class that holds type char in the C++ class, My_vec. For part 2 of the the assignment, the My_vec class was modified to support generic programming using templates. This means that the My_vec class, now the TemplateMy_vec class, can support more than just the char datatype; it can use any datatype fed into it. This could mean that it is possible to even put objects as the array type into the TemplateMy_vec class.

Data Structures Description

- Theoretical Definition

Abstract Data Type that specifies the type of data stored for the operations that support the data. The main feature of ADT's is a clear description of the input to each operation. The action of each operation its return type.

- Real Implementations

In the first part of the lab, a vector class of type char was implemented. Within this class were functions that not only created the class were stored, but aslo functions that could perform operations on the vectors that were created. For part 2, the same vector class was implemented but was instead of just only being able to process type char, templates were used in order to give the vector the capability of being used with multiple data types. Functions for elem_at_rank(), insert_at_rank(), class constructor, copy constructor, destructor, assignement opeartor, overloaded the [] operator, find_max_index, overloading the '<<' operator, and a sorting function were all written so that the vector could be used flexibilty.

- Analysis of best and worst scenarios for vector

The best part about this vector class is that we can perform different operation on the data, creating copies as needed, and multiple types of data can be stored and manipulated. However, a drawback to this new class is that a concatenation function wasn't added to the class. This means that you can't add a vector to another vector.

Instructions to compile and Run

To compile, for part one:

Go to the folder, "Part 1"

Use the command g++ -std=c++11 *.cpp -o main

Then type <./main> into the terminal to run

To compile for part 2:

Go to the folder, Part 2

Use the command g++ -std=c++11 *.cpp -o main

Then type <./main> into the terminal to run

There are no terminal inputs for the testing

Output will show the content of the vector and size of the vector after each operation

Locgical Exceptions with Bug Description

When the user tries to access an element that is out of range (before 0 or bigger than the size of the vector), the program will display an error message with cerr. The faulty operation will not take place and the program will continue. I originally had the program quit once it hit the exception.

C++ object oriented or generic programming features, C++ 11 features

The My_vec class in part 1 represents object oriented programming in that another class can use the functions within the My_vec class by creating an instance of that object. Part 2 represents generic programming. This is because the TemplateMy_vec class can be used with any data type, even objects, without modifications for either the vector or the class using the vector. I did not use any features that were exclusive to C++11, only basic features like arrays, pointers, classes and templates.

Testing Results

Part 1 Output:

```
v after inserted 'B' at 0:
B

Vector v size: 1
v after inserted 'A' at 0:
A B

Vector v size: 2
Error: Out of range
insert_at_rank

v after inserted 'D' at rank 10:
A B

Vector v size: 2
v after removing from rank 1:
A

Vector v size: 1
v after replace at rank 0 with 'E':
E

Vector v size: 1
Copy Constructor Called
E

Error: Cannot replace at element 2
Element out of range
Function: replace_at_rank

v1 after copied from v and 'Y' inserted at rank 2:
New: E

V2 after inserting 'K' at 0:
V2: K

Vector v2 size: 1
V2 after copy assignment:
V2: E

Vector v2 size: 1

V3: after set to 1, 2, 3, 4, 5:
1 2 3 4 5

Vector v3 size: 5
The index with the largest character is: 4

Copy Constructor Called
V3 sorted from greatest to least:
1 2 3 4 5

Error: Cannot replace at element 14
Element out of range
Function: replace_at_rank

v3 after replaced at rank 14 with 'S':
1 2 3 4 5
```

Part 2 Output:

```
Templated_v after inserted 2.33 at 0:
2.33

Templated_v size: 1

Templated_v after inserted 5.66 at 0:
5.66 2.33

Vector Templated_v size: 2

Error: Out of range
insert_at_rank

Templated_v after inserted 3.412 at rank 10:
5.66 2.33

Vector Templated_v size: 2

Templated_v after removing from rank 1:
5.66

Templated_vector v size: 1

Templated_v after replace at rank 0 with 6.5432:
6.5432

Vector Templated_v size: 1

Copy Constructor Called
6.5432

Error: Cannot replace at element 2
Element out of range
Function: replace_at_rank

Templated_v1 after copied from Templated_v and 9.212 inserted at rank 2:
New: 6.5432


Templated_v2 after inserting 5.1313 at 0:
Templated_v2: 5.1313

Vector Templated_v2 size: 1

Templated_v2 after copy assignment:
Templated_v2: 6.5432

Vector Templated_v2 size: 1

Templated_v3: after set to 6.4545, 121.222, 16.0, 3.1415, 3.1425:
6.4545 121.222 16 3.1415 3.1425

Vector Templated_v3 size: 5

The index with the largest character is: 1

Copy Constructor Called
Templated_v3 sorted from least to greatest:

3.1415 3.1425 6.4545 16 121.222

Error: Cannot replace at element 14
Element out of range
Function: replace_at_rank

Templated_v3 after replaced at rank 14 with 5.44444444:
3.1415 3.1425 6.4545 16 121.222
```