

Lab 5 – Exception Handling and Templates

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Compile with clang++ with included Makefile, simply type “make” into terminal and it’ll compile and run the code.

Otherwise: “ g++ -o main --debug -Wall -g -linclude src/ .cpp ” also works*

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Task 1:

Shelf.shelfAdd():

This function checks if the next item in the stack exceeds the global limit that's set for shelf size. If it does exceed the capacity of the shelf, it deletes the pointer to item that is created in addGame()/addMovie() functions inside main.cpp and throws a fullShelf exception. If the capacity isn't exceeded the item in the array at the position of the next item is set to the item created in those functions addGame()/addMovie()).

Shelf.shelfRemove():

This function checks if the items in the stack are less than 0, for which the stack/shelf is empty at zero. If the stack is less equal to 0 it will throw an emptyShelf exception. If there's items remaining in the stack, then the index is decreased to return the item that's being removed and shelfAdd replaces the item removed.

Task 2:

```
Would you like to view your (1=Movies or 2=Video Games): 1

|-----|
|[Press 1] - to add a Movie to the shelf.|
|[Press 2] - to remove a Movie from the shelf.|
|[Press 3] - to see how many Movies are on the shelf.|
|[Press 4] - to quit.|
|_____ [   Movie Shelf   ] _____|
|                                     |
Type your selection: 3

[Movies currently in Collection: 6]
Would you like to view your (1=Movies or 2=Video Games): 1

|-----|
|[Press 1] - to add a Movie to the shelf.|
|[Press 2] - to remove a Movie from the shelf.|
|[Press 3] - to see how many Movies are on the shelf.|
|[Press 4] - to quit.|
|_____ [   Movie Shelf   ] _____|
|                                     |
Type your selection: 1

Enter the Title: Schindlers List
Enter the Description: A movie about a man who rescues prisoners from a labor camp
Enter the Age Rating: R

Title: Schindlers List - Description: A movie about a man who rescues prisoners from a labor camp, For audiences:
R
Added to Collection!
Would you like to view your (1=Movies or 2=Video Games): 1

|-----|
|[Press 1] - to add a Movie to the shelf.|
|[Press 2] - to remove a Movie from the shelf.|
|[Press 3] - to see how many Movies are on the shelf.|
|[Press 4] - to quit.|
|_____ [   Movie Shelf   ] _____|
|                                     |
Type your selection: 1

Enter the Title: Norbit
Enter the Description: Eddie Murphy in a comedy
Enter the Age Rating: PG-13

Title: Norbit - Description: Eddie Murphy in a comedy, For audiences: PG-13
Added to Collection!
Would you like to view your (1=Movies or 2=Video Games): 1

|-----|
|[Press 1] - to add a Movie to the shelf.|
|[Press 2] - to remove a Movie from the shelf.|
|[Press 3] - to see how many Movies are on the shelf.|
|[Press 4] - to quit.|
|_____ [   Movie Shelf   ] _____|
|                                     |
Type your selection: 3

[Movies currently in Collection: 8]
Would you like to view your (1=Movies or 2=Video Games): █
```

```

Would you like to view your (1=Movies or 2=Video Games): 1

| [Press 1] - to add a Movie to the shelf. |
| [Press 2] - to remove a Movie from the shelf. |
| [Press 3] - to see how many Movies are on the shelf. |
| [Press 4] - to quit. |
| _____ [ Movie Shelf ] _____ |
|                                     |
| Type your selection: 1 |

Enter the Title: Madea goes to the moon
Enter the Description: Madea goes on an adventure to the moon
Enter the Age Rating: PG-13

Title: Madea goes to the moon - Description: Madea goes on an adventure to the moon, For audiences: PG-13
Added to Collection!
Would you like to view your (1=Movies or 2=Video Games): 1

| [Press 1] - to add a Movie to the shelf. |
| [Press 2] - to remove a Movie from the shelf. |
| [Press 3] - to see how many Movies are on the shelf. |
| [Press 4] - to quit. |
| _____ [ Movie Shelf ] _____ |
|                                     |
| Type your selection: 1 |

Enter the Title: The Civil War on Drugs
Enter the Description: A wkuk film about the real events surrounding the actual reason for civil war.
Enter the Age Rating: PG-13

Title: The Civil War on Drugs - Description: A wkuk film about the real events surrounding the actual reason for civil war., For audiences: PG-13
Added to Collection!
Would you like to view your (1=Movies or 2=Video Games): 1

| [Press 1] - to add a Movie to the shelf. |
| [Press 2] - to remove a Movie from the shelf. |
| [Press 3] - to see how many Movies are on the shelf. |
| [Press 4] - to quit. |
| _____ [ Movie Shelf ] _____ |
|                                     |
| Type your selection: 2 |

Title: The Civil War on Drugs - Description: A wkuk film about the real events surrounding the actual reason for civil war., For audiences: PG-13
Removed from Collection!
Would you like to view your (1=Movies or 2=Video Games): 1

| [Press 1] - to add a Movie to the shelf. |
| [Press 2] - to remove a Movie from the shelf. |
| [Press 3] - to see how many Movies are on the shelf. |
| [Press 4] - to quit. |
| _____ [ Movie Shelf ] _____ |
|                                     |
| Type your selection: 3 |

[Movies currently in Collection: 1]
Would you like to view your (1=Movies or 2=Video Games): █

```

Task 3:

```
|_____ [ Movie Shelf ] _____  
Type your selection: 2
```

Title: The Civil War on Drugs Description: A wkuk film about the real events surrounding the actual reason for c
ivil war., For audiences: PG-13
Removed from Collection!

```
|_____ [ Movie Shelf ] _____|
Type your selection: 3
```

```
[Movies currently in Collection: 1]
```

```
|_____ [ Movie Shelf ] _____  
Type your selection: 2
```

Title: Madea goes to the moon - Description: Madea goes on an adventure to the moon, For audiences: PG-13
Removed from Collection!

```
|_____ [ Movie Shelf ] _____  
Type your selection: 2
```

```
[Exception: Shelf is empty]
No Movies left on shelf, add a Movie before removing any more!
Would you like to view your (1=Movies or 2=Video Games):
```

```

Would you like to view your (1=Movies or 2=Video Games): 1

[[Press 1] - to add a Movie to the shelf.
[[Press 2] - to remove a Movie from the shelf.
[[Press 3] - to see how many Movies are on the shelf.
[[Press 4] - to quit.
|_____ [ Movie Shelf ] _____|
|                                     |
Type your selection: 1

Enter the Title: Aliens
Enter the Description: A movie about aliens
Enter the Age Rating: R

Title: Aliens - Description: A movie about aliens, For audiences: R
Added to Collection!
Would you like to view your (1=Movies or 2=Video Games): 1

[[Press 1] - to add a Movie to the shelf.
[[Press 2] - to remove a Movie from the shelf.
[[Press 3] - to see how many Movies are on the shelf.
[[Press 4] - to quit.
|_____ [ Movie Shelf ] _____|
|                                     |
Type your selection: 3

[Movies currently in Collection: 10]
Would you like to view your (1=Movies or 2=Video Games): 1

[[Press 1] - to add a Movie to the shelf.
[[Press 2] - to remove a Movie from the shelf.
[[Press 3] - to see how many Movies are on the shelf.
[[Press 4] - to quit.
|_____ [ Movie Shelf ] _____|
|                                     |
Type your selection: 1

Enter the Title: Space Jam
Enter the Description: A basketball movie starring cartoon characters
Enter the Age Rating: PG

[Exception caught: Shelf is full]
Movie not added, remove a Movie to add another to the shelf !
Would you like to view your (1=Movies or 2=Video Games): 1

[[Press 1] - to add a Movie to the shelf.
[[Press 2] - to remove a Movie from the shelf.
[[Press 3] - to see how many Movies are on the shelf.
[[Press 4] - to quit.
|_____ [ Movie Shelf ] _____|
|                                     |
Type your selection: 1

Enter the Title: Basketball
Enter the Description: Matt stone and Trey parker made a movie about a fictional sport called basketball
Enter the Age Rating: R

[Exception caught: Shelf is full]
Movie not added, remove a Movie to add another to the shelf !
Would you like to view your (1=Movies or 2=Video Games): █

```

Trapping an error within the scope of the class leads to more robust code, as opposed to catching an error inside of the function affecting the object. If an exception occurs and is handled within a class, we know that any instance of that object is going to correctly throw and handle their own exceptions. This is an example of encapsulation, one of the core principles of Object-Oriented Programming.

Task 4:

```
|[Press 1] - to add a Video Game to the shelf.
|[Press 2] - to remove a Video Game from the shelf.
|[Press 3] - to see how many Video Games are on the shelf.
|[Press 4] - to quit.
|_____ [Video Game Shelf] _____
|                                     Type your selection: 1

Enter the Name: Doom Eternal
Enter the Genre: Slasher
Enter the Description: Kill aliens as Doom guy.
Video Game: Doom Eternal, Genre: Slasher, Description:  aliens as Doom guy.
    Added to Collection!
Would you like to view your (1=Movies or 2=Video Games): 2

|[Press 1] - to add a Video Game to the shelf.
|[Press 2] - to remove a Video Game from the shelf.
|[Press 3] - to see how many Video Games are on the shelf.
|[Press 4] - to quit.
|_____ [Video Game Shelf] _____
|                                     Type your selection: 3

                                [Video Games currently in Collection: 1]
Would you like to view your (1=Movies or 2=Video Games): 1

|[Press 1] - to add a Movie to the shelf.
|[Press 2] - to remove a Movie from the shelf.
|[Press 3] - to see how many Movies are on the shelf.
|[Press 4] - to quit.
|_____ [    Movie Shelf    ] _____
|                                     Type your selection: 3

                                [Movies currently in Collection: 10]
Would you like to view your (1=Movies or 2=Video Games): 2

|[Press 1] - to add a Video Game to the shelf.
|[Press 2] - to remove a Video Game from the shelf.
|[Press 3] - to see how many Video Games are on the shelf.
|[Press 4] - to quit.
|_____ [Video Game Shelf] _____
|                                     Type your selection: 1

Enter the Name: Balders Gate 3
Enter the Genre: RTS
Enter the Description: Garbage sorry, Dont waste your time.
Video Game: Balders Gate 3, Genre: RTS, Description:  sorry, Dont waste your time.
    Added to Collection!
Would you like to view your (1=Movies or 2=Video Games): 2

|[Press 1] - to add a Video Game to the shelf.
|[Press 2] - to remove a Video Game from the shelf.
|[Press 3] - to see how many Video Games are on the shelf.
|[Press 4] - to quit.
|_____ [Video Game Shelf] _____
|                                     Type your selection: 3

                                [Video Games currently in Collection: 2]
Would you like to view your (1=Movies or 2=Video Games): █
```

```
Would you like to view your (1=Movies or 2=Video Games): 2

[[Press 1] - to add a Video Game to the shelf. |
[[Press 2] - to remove a Video Game from the shelf. |
[[Press 3] - to see how many Video Games are on the shelf. |
[[Press 4] - to quit. |
|_____ [Video Game Shelf] _____|
|                                     |
|      Type your selection: 2      |

Video Game: Balders Gate 3, Genre: RTS, Description:  sorry, Dont waste your time.
      Removed from Collection!
Would you like to view your (1=Movies or 2=Video Games): 2

[[Press 1] - to add a Video Game to the shelf. |
[[Press 2] - to remove a Video Game from the shelf. |
[[Press 3] - to see how many Video Games are on the shelf. |
[[Press 4] - to quit. |
|_____ [Video Game Shelf] _____|
|                                     |
|      Type your selection: 2      |

Video Game: Doom Eternal, Genre: Slasher, Description:  aliens as Doom guy.
      Removed from Collection!
Would you like to view your (1=Movies or 2=Video Games): 2

[[Press 1] - to add a Video Game to the shelf. |
[[Press 2] - to remove a Video Game from the shelf. |
[[Press 3] - to see how many Video Games are on the shelf. |
[[Press 4] - to quit. |
|_____ [Video Game Shelf] _____|
|                                     |
|      Type your selection: 2      |

[Exception: Shelf is empty]
No Video Games left on shelf, add a Video Game before removing any more!
Would you like to view your (1=Movies or 2=Video Games): █
```

The main advantage of using templates is versatility. Instead of writing two classes that are functionally exactly the same for two data types, we can write one class and pass in the data type we want to use. This will allow for a lot of code reusability, making our programs simpler and easier to maintain.

1. Write a lab report including the following information:
 - a. (A description of the objectives/concepts explored in this assignment including why you think they are important to this course and a career in CS and/or Engineering.)

The tasks for this lab include writing a template class, exception class, and dynamic memory allocation.

The writing of a template class is important to CS and this class because it allows us to create more complicated forms of abstraction. It makes it so we don't have to create different functions and classes for each data type and so we don't have to specify a datatype.

The exception class is important to CS and data structures because its widely used in many languages to handle errors. Error handling is an important part of CS as it allows us to stop users and ourselves from breaking things if something goes somewhere it's not supposed to. In data structures its extremely important because it allows us to stop someone from performing operations that will alter, lose data and we can handle cases better when they inevitably do.

Dynamic memory allocation is very important to our understanding of computers and how things are stored and work. If we have a good understanding of memory management our code will be faster and be more reliable in turn. Its also important to data structures as we can use it in conjunction with our data structures to reallocate and deallocate memory according to what kind of data structure we're making.