The Programming Assignment Report Instructions
CSCE 221

1. The description of an assignment problem.

   Programming Assignment 2 was a 2 part assignment. Part 1 dealt with creating a doubly linked list for integers and then converting it over to a templated doubly linked list so that you can provide it any type.

   Part 2 took the templated doubly linked list and created a new class Record that would store the information of a singular book and putting both those together to create a library management system.

2. The description of data structures and algorithms used to solve the problem.

   (a) Provide definitions of data structures by using Abstract Data Types (ADTs)

   The data structures used in this assignment included a vector that held 26 different doubly linked lists. The doubly linked lists were of type Record and held all the records in the library. The Record class was made up of different strings each corresponding to a different attribute of a book such as title, author, and the ISBN number.

   (b) Write about the ADTs implementation in C++.

   The implementation of the ADT included functions that modified and retrived data. The Record class had multiple getters and setters to do just that. The doubly linked list also had functions to add elements and remove elements.

   (c) Describe algorithms used to solve the problem.

   The main algorithms used were linear search algorithms and just other O(n) algorithms to iterate through the entire doulby linked list.

   (d) Analyze the algorithms according to assignment requirements.

   In the Library.cpp file,, the search, import database, add, and remove all have an O(n) runtime. The print database and export functions have a O(n^2) runtime. The prompt functions are all O(1).

   In the Record.cpp file, the equality operator and output stream functions are in O(1). The input stream function has an O(n) runtime.

1. A C++ organization and implementation of the problem solution

   (a) Provide a list and description of classes or interfaces used by a program such as classes used to implement the data structures or exceptions.

   1 - Search: Searchs through the entire database for a specified title and returns a vector of all matching records

   2 - Import Database: Imports records from a file and avoids importing duplicates then returns the number of records imported.

   3 - Export Database: Exports all the records from the database into a file then returns the number of records exported.

   4 - Add Record: Adds the specified record to the database in the correct location and in order.

   5 - Remove Record: Removes the specified record from the database.

   6 - Prompt Yes/No: Asks the user to type Y or N and returns the choice.

   7 - Prompt Menu: Outputs all possible menu choices and asks the user to pick one. Returns the choice.

   8 - Prompt Record: Gets the strings from the user to create a new record.

   9 - Prompt Title: Asks the user for a book title.

   10 - Prompt String: Asks the user whatever the specified string is.

   (b) Include in the report the class declarations from a header file (.h) and their implementation from a source file (.cpp).

   Submitted Report.cpp to Mimir

   (c) Provide features of the C++ programming paradigms like Inheritance or Polymorphism in case of object oriented programming, or Templates in the case of generic programming used in your implementation.

   Templating allowed us to use our doubly linked list class for Records in this case but also allows us to reuse the same code for any other object type.

2. A user guide description how to navigate your program with the instructions how to:

   (a) compile the program: specify the directory and file names, etc.

   Directory: \PA2 Handout 2\Starter Code\Library\

   File Names: Library.cpp, Library.h, Record.cpp, Record.h, TemplatedDLList.h, library-main.cpp

   (b) run the program: specify the name of an executable file.

   File created: a.out

1. Specifications and description of input and output formats and files

   (a) The type of files: keyboard, text files, etc (if applicable).

   The prompt functions require the keyboard to get an input from the user

   The import and export functions in Library.cpp use .txt files to import records as well as export them to a new file.

   (b) A file input format: when a program requires a sequence of input items, specify the number of items per line or a line termination. Provide a sample of a required input format.

   The import database function uses a .txt file that is in a specific order. Each element is on a different line in the order of title, author, ISBN, year, and edition. Theres a blank space after that.

   Harry Potter And The Chamber Of Secrets

   J. K. Rowling

   978-0439064873

   2000

   1st edition

   The prompt record also uses a similar format but it asks the user to type in each element on its own line in the terminal window.

2. Discuss possible cases when your program could crash because of incorrect input (a wrong file name, strings instead of a number, or such cases when the program expects 10 items to read and it finds only 9.)

   Import database does not check to see if the file is a valid file. Prompt Menu does not check if the choice entered is valid.

3. Provide types of exceptions and their purpose in your program.

   (a) logical exceptions (such as deletion of an item from an empty container, etc.).

   All the exceptions were handled in the Templated Doubly Linked List. Exceptions were thrown when removing items from empty lists and adding to a list that does not exist.

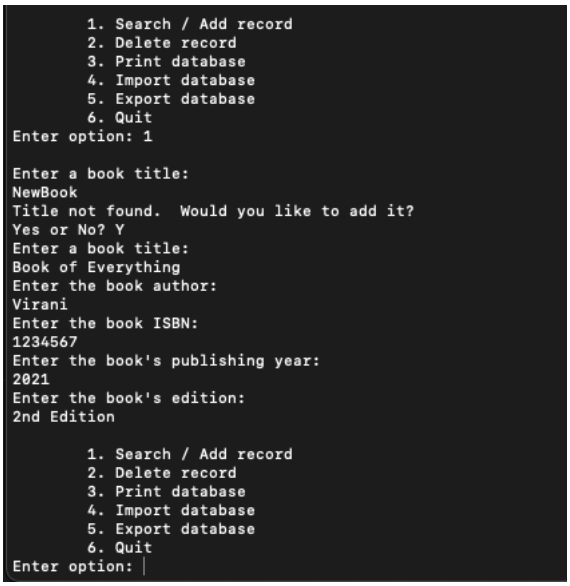
   (b) runtime exception (such as division by 0, etc.)

   There were none in my program.

4. Test your program for correctness using valid, invalid, and random inputs (e.g., insertion of an item at the beginning, at the end, or at a random place into a sorted vector). Include evidence of your testing, such as an output file or screen shots with an input and the corresponding output.

```
(base) Zeeshans-MacBook-Pro:Library zeeshanvirani$ ./a.out
        1. Search / Add record
        2. Delete record
        3. Print database
        4. Import database
        5. Export database
        6. Quit
Enter option: 4

Enter name of file to import from: book.txt
Imported 10 records

        1. Search / Add record
        2. Delete record
        3. Print database
        4. Import database
        5. Export database
        6. Quit
Enter option: 3

Artificial Intelligence: A Modern Approach
Stuart Russell, Peter Norvig
978-0136042594
2009
3rd edition

Echo
Pam Munoz Ryan
978-0439874021
2015
1st edition

H is for Hawk
Helen Macdonald
978-0802123411
2015
1st edition

Harry Potter And The Chamber Of Secrets
J. K. Rowling
978-0439064873
2000
1st edition

Harry Potter and the Cursed Child
J. K. Rowling
978-1338099133
```

```
        1. Search / Add record
        2. Delete record
        3. Print database
        4. Import database
        5. Export database
        6. Quit
Enter option: 2

Enter a book title:
Nonexistent Book
Title not found.

        1. Search / Add record
        2. Delete record
        3. Print database
        4. Import database
        5. Export database
        6. Quit
Enter option:
```


1. Search / Add record
2. Delete record
3. Print database
4. Import database
5. Export database
6. Quit
Enter option: 1
Enter a book title:
NewBook
Title not found. Would you like to add it?
Yes or No? Y
Enter a book title:
Book of Everything
Enter the book author:
Virani
Enter the book ISBN:
1234567
Enter the book's publishing year:
2021
Enter the book's edition:
2nd Edition
1. Search / Add record
2. Delete record
3. Print database
4. Import database
5. Export database
6. Quit
Enter option: