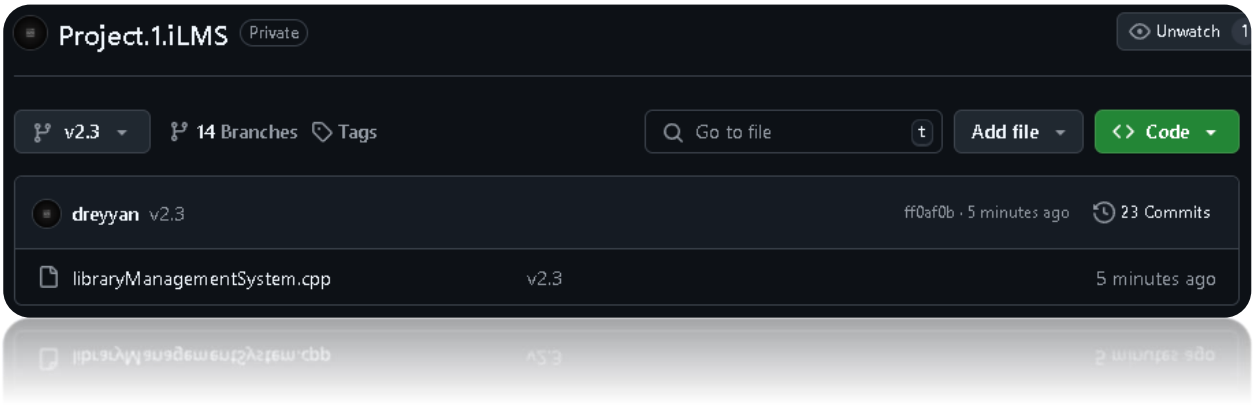
# iSort
# LIBRARY MANAGEMENT SYSTEM
# (iSort LMS v2.3)

**By: Adrian Dominic L. Tan - BSCS 1-A**

**W**elcome to the **iSort Library Management System(v2.3)**, my very first major project! This detailed manual is divided into seven parts:

**J**ust a little background for context, I developed this program for 4 straight days, from October 29 to November 1, 2024. For the IDE, I used Clion, a cross-platform IDE for C & C++. This current version(v2.3) is the latest and most functional version to date.

For more updates in the future, you can access this project via GitHub:
https://github.com/dreyyan/Project.1.iLMS

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## I. Introduction

The iSort Library Management System(iLMS) is a comprehensive, user-friendly, organized book management system that allows you to manage your book files instantly.

The purpose of the iLMS is to manage book files instantly, utilizing functions that manipulate book files according to the user's interest. These functions are implemented with comprehensive validation checks for input, both in navigation and information, ensuring little to no error while using the system.

The primary use case for this program is to enable library staff to create books via "book files" that act as virtual books, allowing them to manage borrows, returns, transaction history, and inventory records. Although mainly for library staff, the iLMS can also be utilized for both students and teachers, which helps to keep track of books at home and/or in school.

## II. System Overview(Functionalities)

The iLMS features a wide array of useful functions, primarily based on the CRUD(Create, Read, Update, Delete) method. These methods/key functionalities include:

**CRUD(Main Functionalities):**

- createBookfile()

**C**REATE a "book file" that act as a virtual book thru ".txt" files, allowing the user to input book information later on. This function addresses the CREATE(#1) operation.

- inputBookInformation()

**C**REATE or store validated book information in the specified book file. This function also addresses the CREATE(#2) operation.

- readBookfile()

**R**EAD the book file's filename/title, along with its contents line-by-line. This function addresses the READ operation.

- updateBookInformation()

**U**PDATE a book file's stored information on one line and freely modifying its content. This function addresses the UPDATE operation.

- deleteBookfile()

**D**ELETE a book file, completely wiping out its contents and removing it from the booklist. This function addresses the DELETE operation.

**Sub-Functions:**

- showBookList()

Show the list of books “added” to the system, along with its validated ISBN

- borrowBook()

Borrow a book from the list of added books, making it unavailable to borrow, read, or access until returned

- returnBook()

Return a book from the list of added books, making it available to borrow and access the book file

- searchBook()

Search a book file from the list of added books, notifying if the book exists, if so, suggests to read the content of the book file

- printBorrowHistory()

Display a printed transcript of the current borrow history, along with the formatted date of borrow

- printReturnHistory()

Display a printed transcript of the current return history, along with the formatted date of return

- displayTableOfContents()

Display the table of contents, which include classes used in the program(for programmers/developers) and a list of all the usable functions, along with its short description and functionality

These 12 functions enhance the iLMS’ capabilities, ensuring a user-friendly experience and efficient system navigation and usage.

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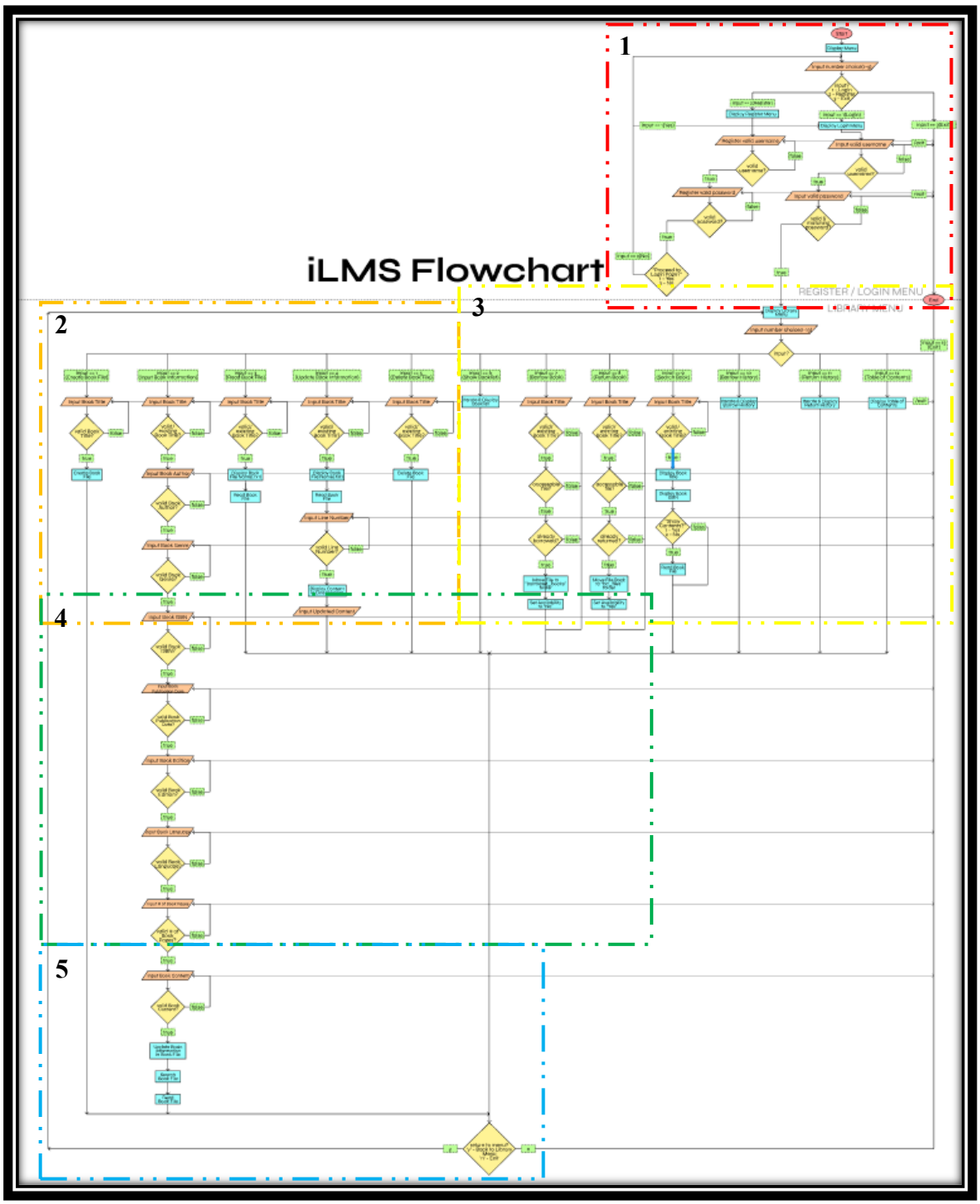
**III. Flowchart(Also available at the folder | File Name: "iLMS Flowchart")**



# iSort
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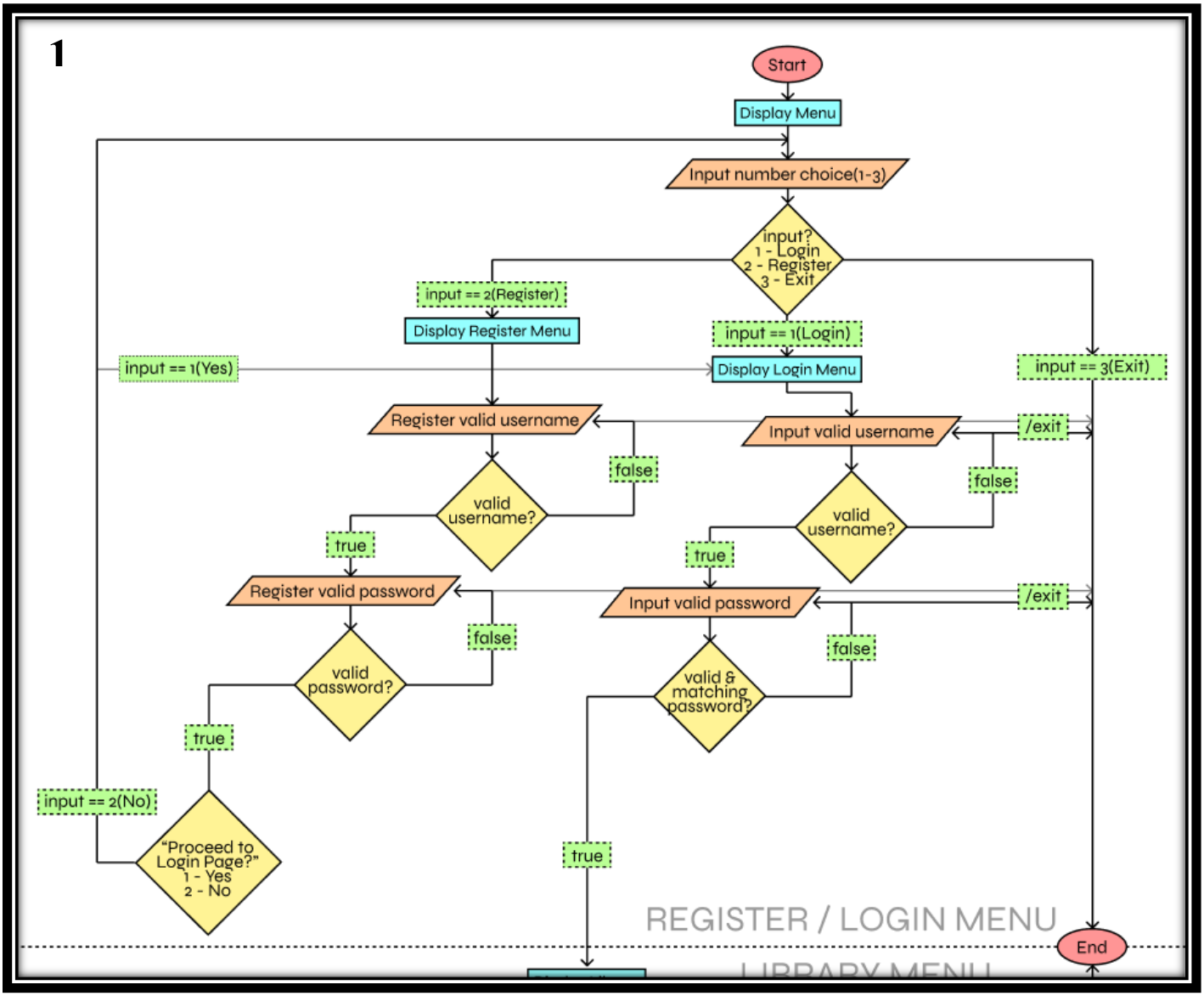
**1**



# iSort
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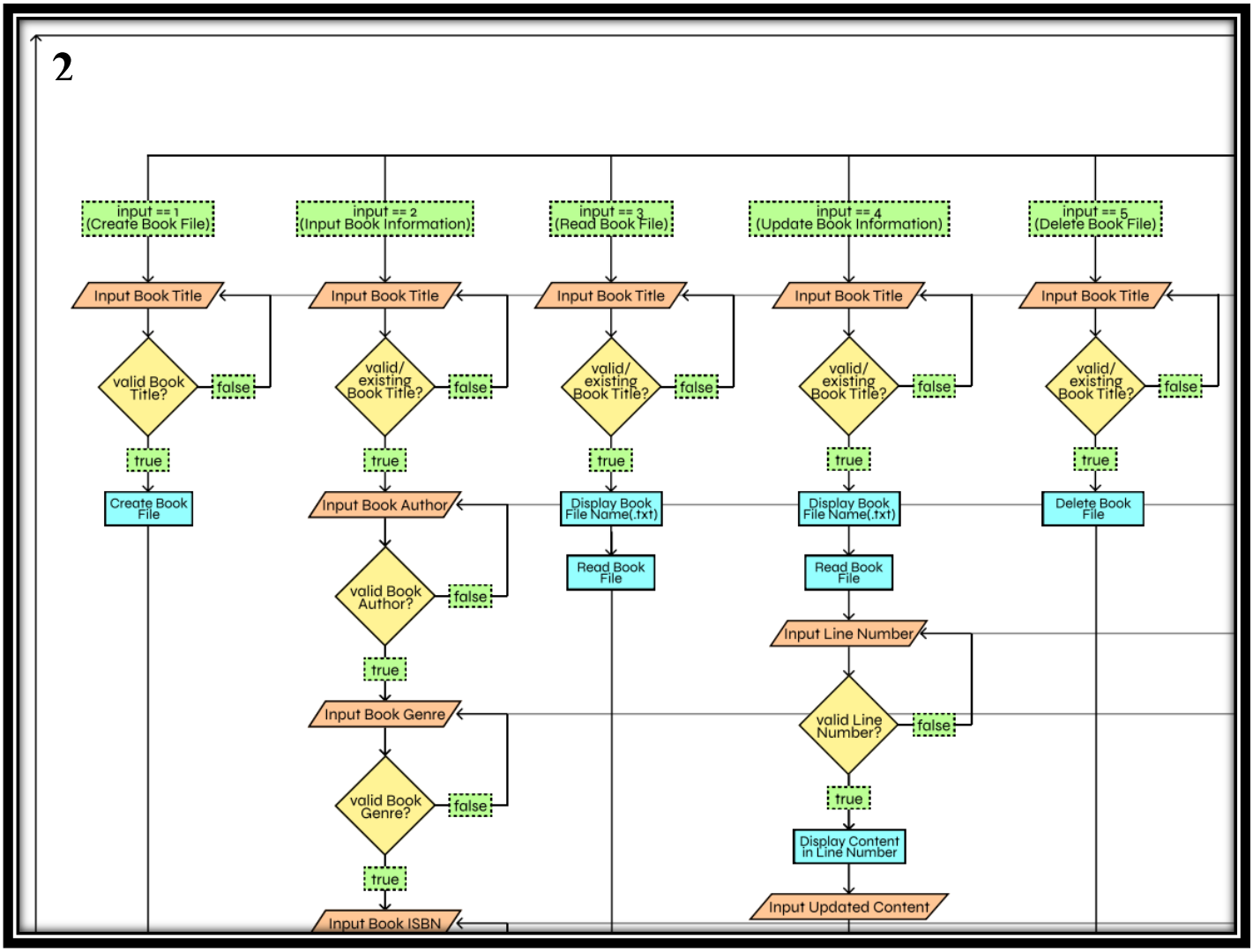

# iSort
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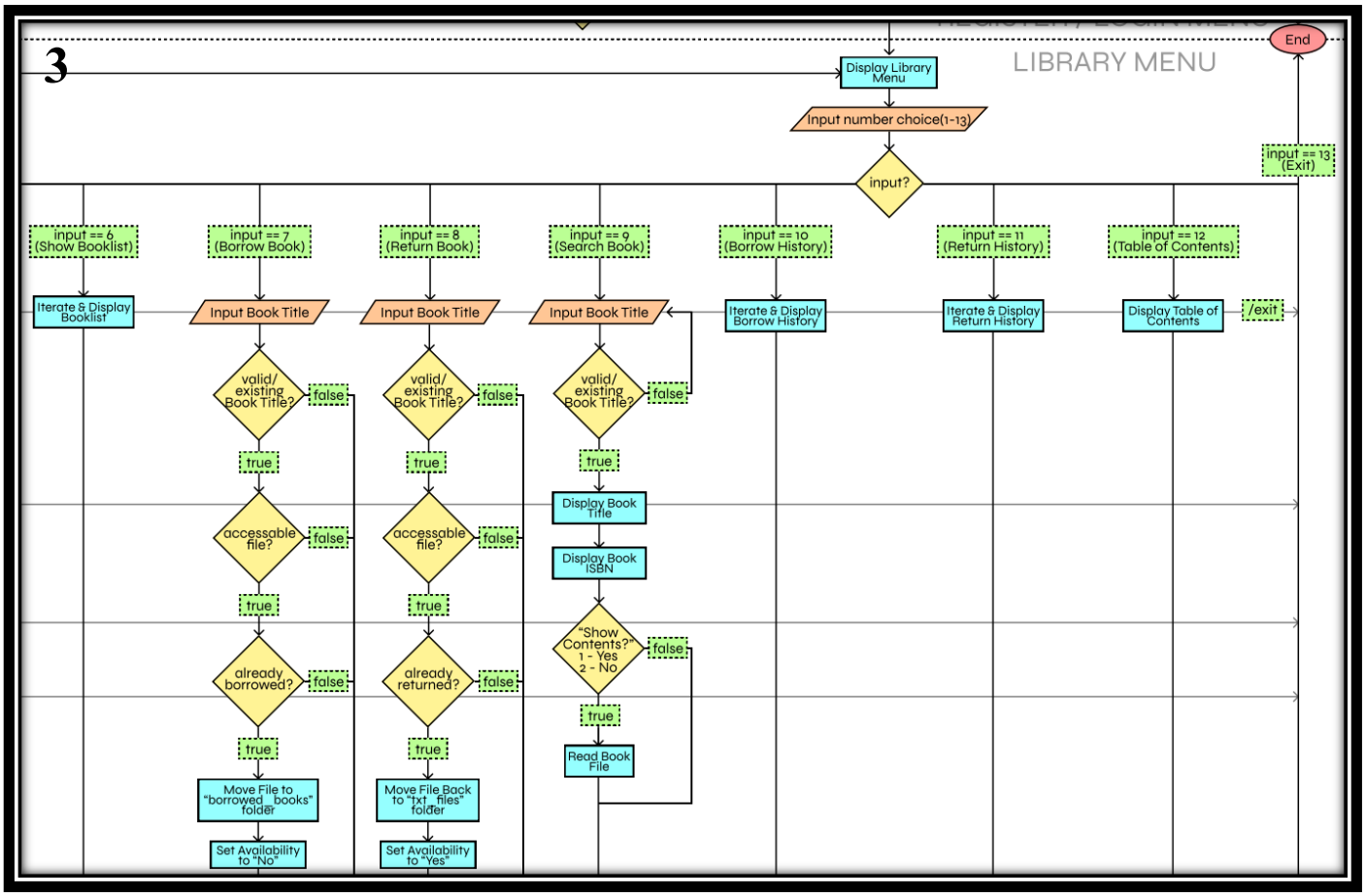

# iSort
# LIBRARY MANAGEMENT SYSTEM
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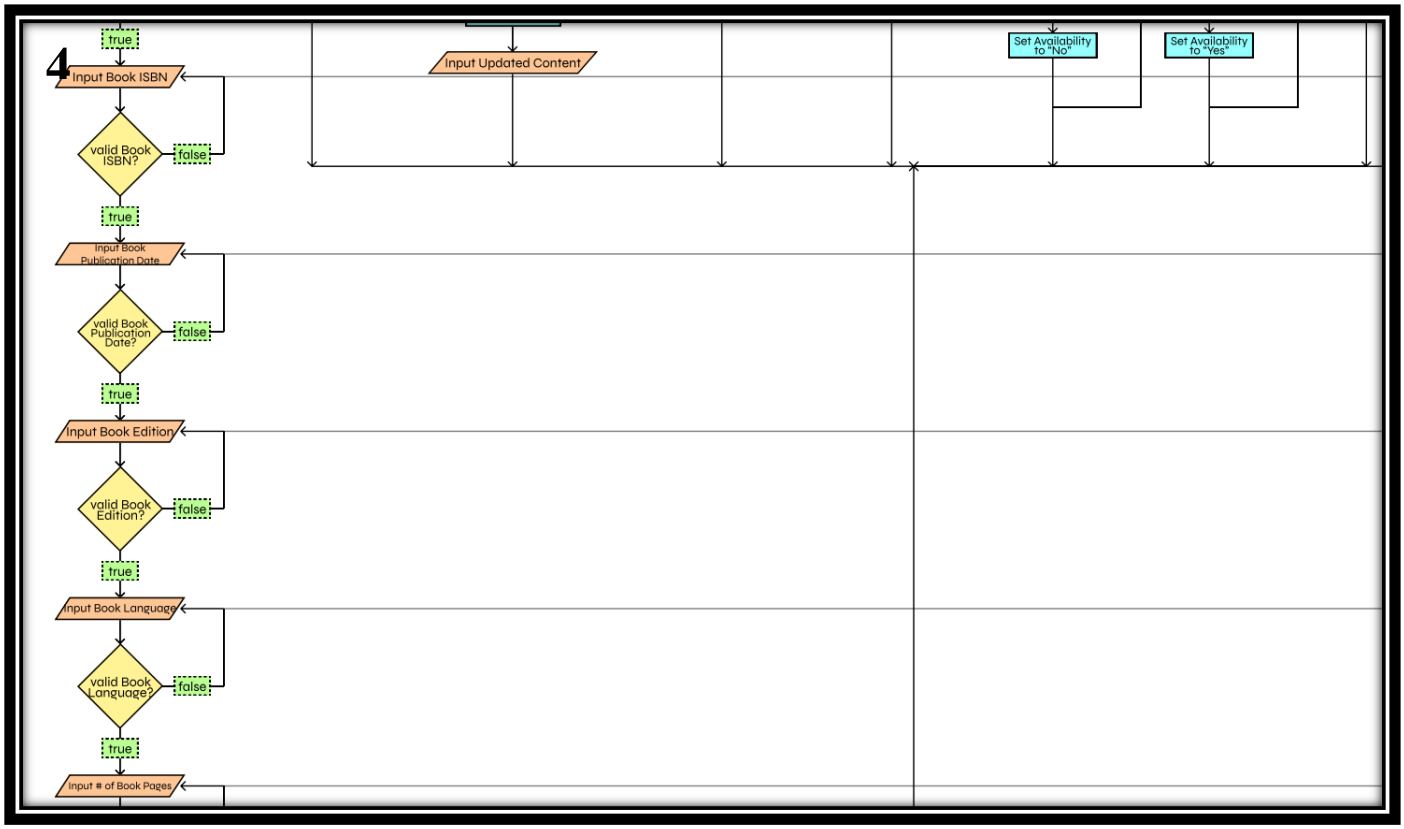
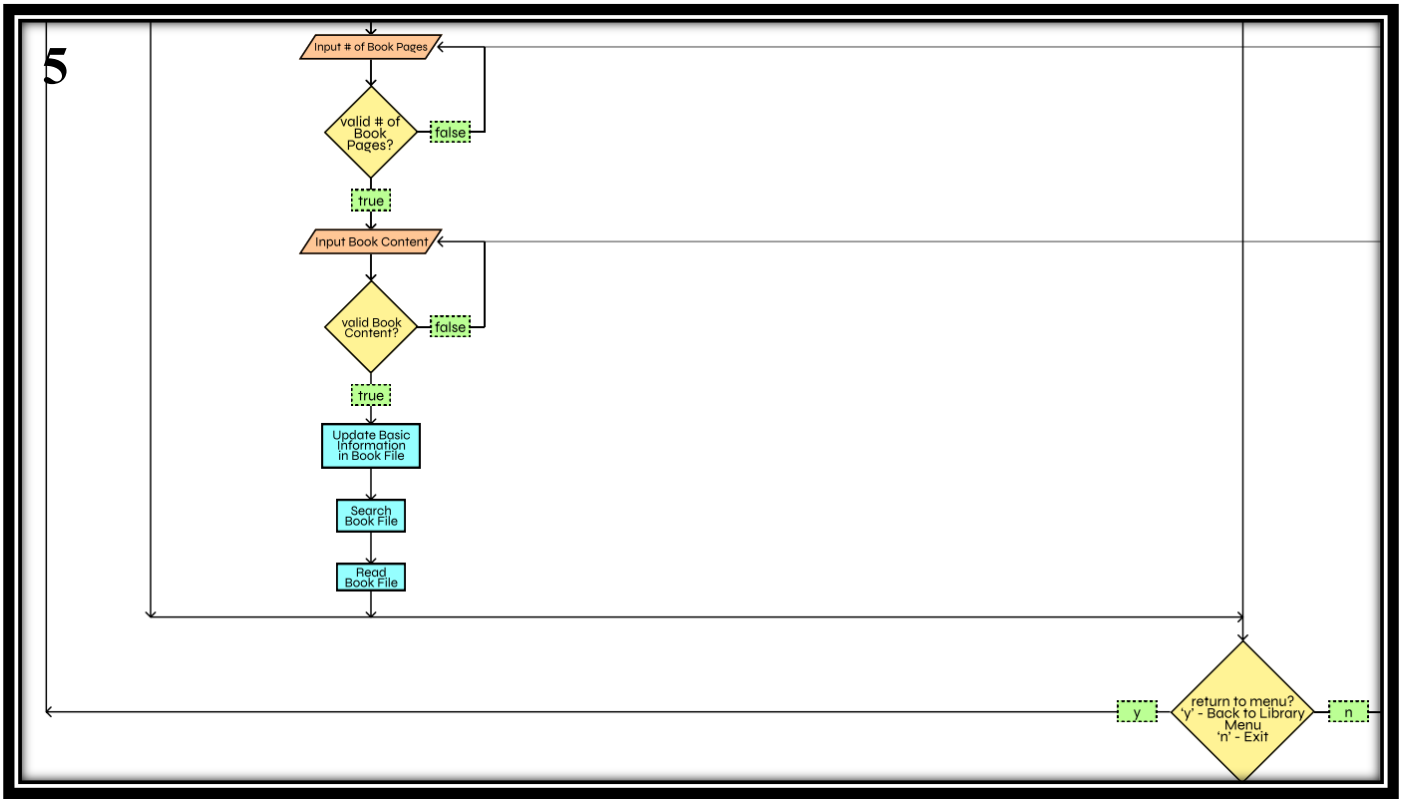


# iSort
# LIBRARY MANAGEMENT SYSTEM
# (iSort LMS v2.3)



# iSort
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## IV. Pseudocode

MENU
1. Display Menu
2. Prompt User to Input Number Choice

Input = 1 | Login:
  LOGIN MENU
  1. Display Login Menu
  2. Prompt User to Input Username
  3. Check if Username is Valid:
    - If Yes, Prompt User to Input Password
    - If No, Prompt User to Input Username Again
  4. Check if Password is Valid:
    - If Yes, Proceed to Library Menu
    - If No, Prompt User to Input Password Again

Input = 2 | Register:
  REGISTER MENU
  1. Prompt User to Register Username
  2. Check if Username is Valid:
    - If Yes, Prompt User to Input Password
    - If No, Prompt User to Input Username Again
  3. Check if Password is Valid:
    - If Yes, Suggest User to Proceed to Login Page
      - Prompt User: "Proceed to Login Page?"
        - Input = 1 | Yes, Go to Login
        - Input = 2 | No, Display Menu
    - If No, Prompt User to Input Password Again

Input = 3 or /exit | Exit:
  Exit the Program

LIBRARY MENU

1. Display Library Menu
2. Prompt User to Input Number Choice

# iSort
# LIBRARY MANAGEMENT SYSTEM
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Input = 1 | Create Book File:
CREATE BOOK FILE
1. Prompt User to Input Book Title
2. Validate Book Title:
- If Valid, Create a Book File (.txt)
- If Invalid, Prompt User to Enter a Valid Book Title
3. Prompt: "Return to Library Menu?"
- If Yes, Return to Library Menu
- If No, Exit Program

Input = 2 | Input Book Information:
INPUT BOOK INFORMATION
1. Prompt User to Input Book Title
2. Validate Book Title, Author, Genre, ISBN, Publication Date, Edition, Language, Page Count, and Content in Sequence:
- For each input, validate and prompt until valid
3. Save Validated Information to Book File
4. Prompt: "Return to Library Menu?"
- If Yes, Return to Library Menu
- If No, Exit Program

Input = 3 | Read Book File:
READ BOOK FILE
1. Validate and Locate Book Title
2. If Exists, Display File Content
3. Prompt: "Return to Library Menu?"
- If Yes, Return to Library Menu
- If No, Exit Program

Input = 4 | Update Book Information:
UPDATE BOOK INFORMATION
1. Validate and Locate Book Title
2. Prompt User for Line Number and New Content
- Display Updated Content after Modification
3. Prompt: "Return to Library Menu?"
- If Yes, Return to Library Menu
- If No, Exit Program

# iSort
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Input = 5 | Delete Book File:
DELETE BOOK FILE
1. Validate and Locate Book Title
2. If Exists, Delete Book File
3. Prompt: "Return to Library Menu?"
   - If Yes, Return to Library Menu
   - If No, Exit Program

Input = 6 | Show Booklist:
SHOW BOOKLIST
1. Display List of All Books in System

Input = 7 | Borrow Book:
BORROW BOOK
1. Display Available Books
2. Validate Book Title for Borrowing
3. If Valid, Move Book to "borrowed_folder" and Set Availability to "No"
4. Prompt: "Return to Library Menu?"
   - If Yes, Return to Library Menu
   - If No, Exit Program

Input = 8 | Return Book:
RETURN BOOK
1. Display Borrowed Books
2. Validate Book Title for Returning
3. If Valid, Move Book to "txt_files" and Set Availability to "Yes"
4. Prompt: "Return to Library Menu?"
   - If Yes, Return to Library Menu
   - If No, Exit Program

Input = 9 | Search Book:
SEARCH BOOK
1. Display All Book Titles
2. Validate Book Title for Search
3. If Exists, Display Book Info and Option to Display Contents
   - Prompt: "Display Contents?"

- If Yes, Show Content; If No, End Search

4. Prompt: "Return to Library Menu?"
   - If Yes, Return to Library Menu
   - If No, Exit Program

Input = 10 | Borrow History:

BORROW HISTORY

1. Display Borrow History
2. Prompt: "Return to Library Menu?"
   - If Yes, Return to Library Menu
   - If No, Exit Program

Input = 11 | Return History:

RETURN HISTORY

1. Display Return History
2. Prompt: "Return to Library Menu?"
   - If Yes, Return to Library Menu
   - If No, Exit Program

Input = 12 | Table of Contents:

TABLE OF CONTENTS

1. Display System Contents and Functions
2. Prompt: "Return to Library Menu?"
   - If Yes, Return to Library Menu
   - If No, Exit ProgramInput = 13 | Exit:
     Exit Program

Input = /exit | Exit Program

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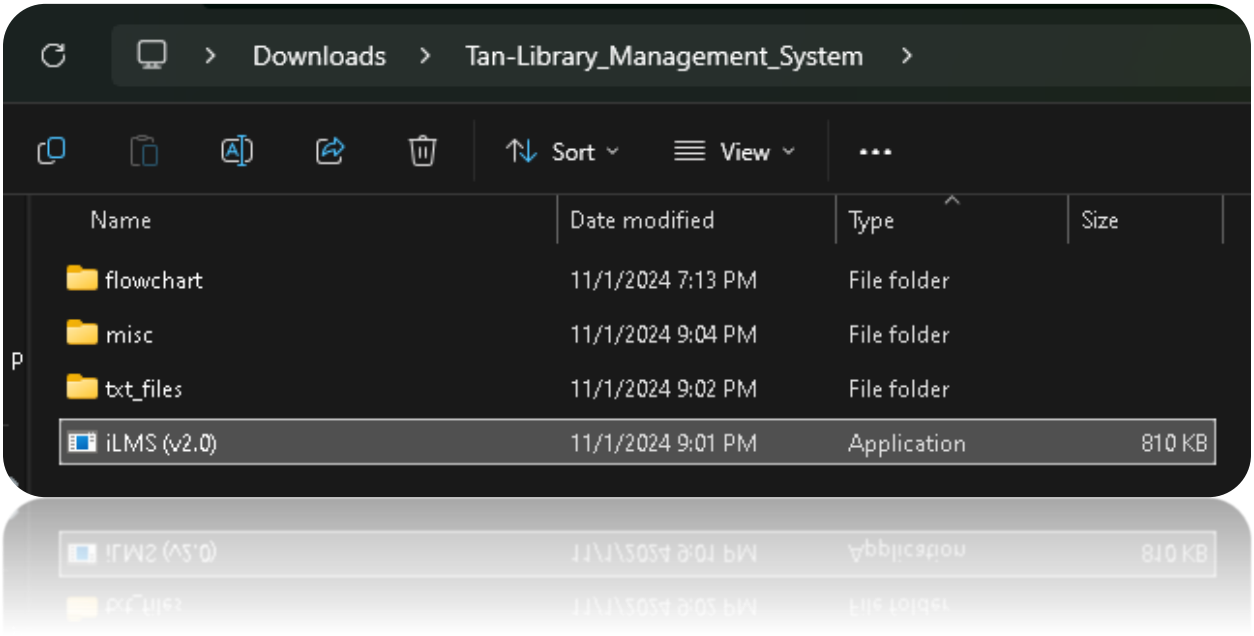
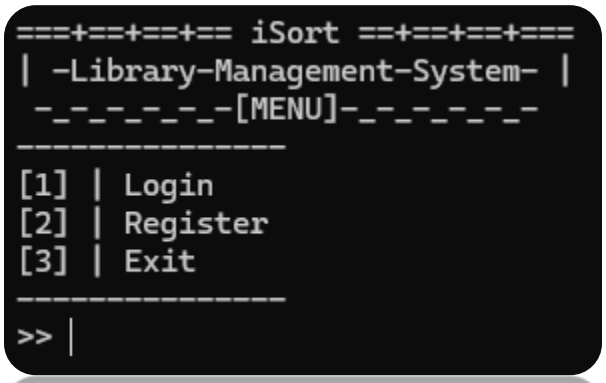
## V. Instructions/Testing

**How to Run:**

1. Inside the "Tan-Library_Management_System" folder, locate the executable(.exe) file named "iLMS.exe". Double-click it, and the command prompt/terminal will open, launching the program.




2. The iSort LMS command-line interface will show, displaying the iLMS Menu. It will prompt you to enter numbers 1-3. Enter either '2' or '3' since you cannot log in to the system yet since you have not created an account. Enter '2' in the interface, which will direct you to the iLMS Register Menu, but if you enter '3', it will exit the program directly.



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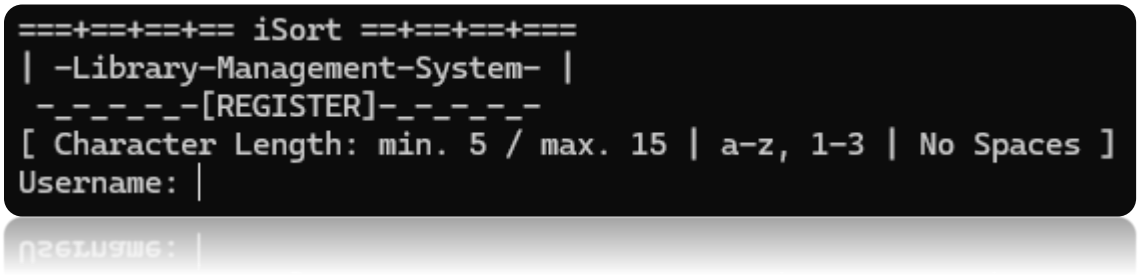
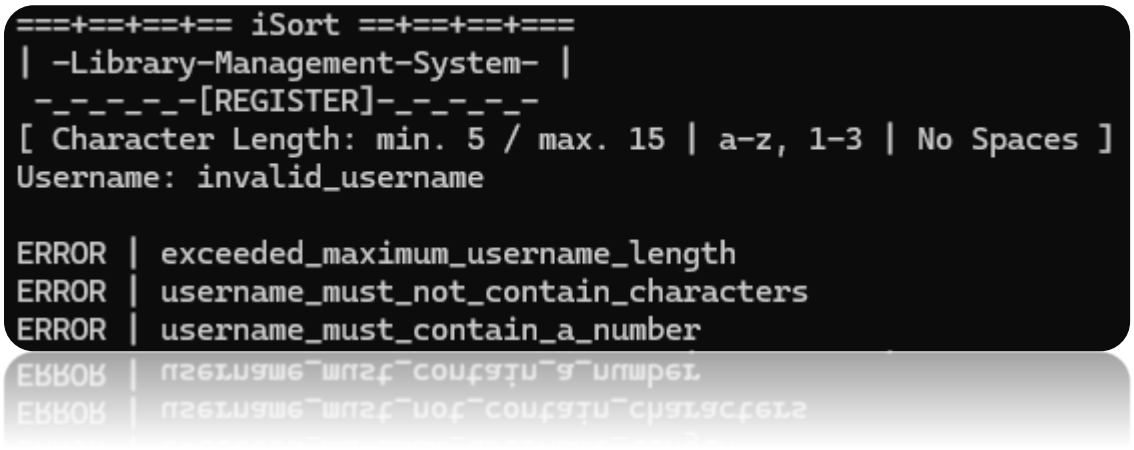
3. In the iLMS Register Menu, the program will prompt you to enter a username. Enter a username that follows validation constraints. Keep in mind, when creating your own username, it must be within 5-15 characters, should only include letters and numbers(no characters), and no spaces.




**NOTE:** If you enter an invalid username, you will receive errors indicating easy-to-read error descriptions.



4. After entering a valid username, the program will then prompt you to enter a password. With the same validation constraints, create your own password. Don't forget to create a password that is secure and hard to guess.

```
===+==+==+== iSort ==+==+==+===
| -Library-Management-System- |
 -_-_-_-_-[REGISTER]-_-_-_-_-
[ Character Length: min. 5 / max. 15 | a-z, 1-3 | No Spaces ]
Username: validUsername1

[ Character Length: min. 5 / max. 15 | a-z, 1-3 | No Spaces ]
Password: ZpOckFjgmSl122
```

5. After entering a valid password, the program will say that you(user) have registered your account successfully. You can now choose to proceed to the iLMS Login Menu. If you enter '1', you will directly proceed to the Login Menu, but if you enter '2', you will go back to the iLMS Main Menu.

```
user 'validUsername1' registered successfully!
| -Library-Management-System- |
 -_-_-_-_-[REGISTER]-_-_-_-_-
------------------------
Proceed to Login Page?
[1] | Yes
[2] | No
------------------------
>>
```

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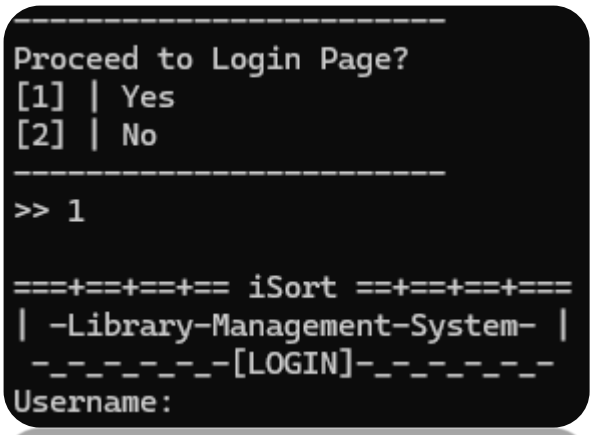
1: iLMS Login Menu | 2: Back to the iLMS Main Menu

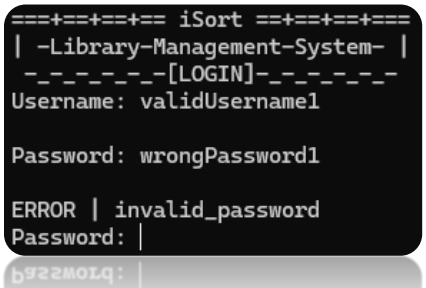




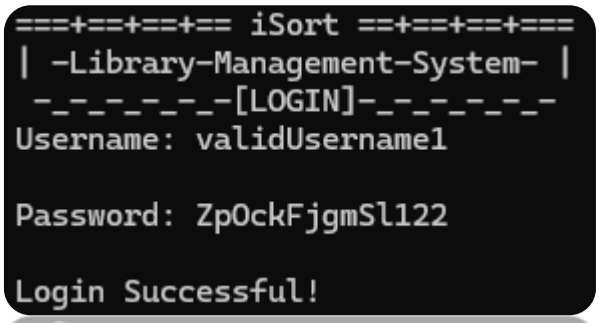
6. When directed to the iLMS Login Menu, you will be asked to enter your username. Make sure that this is your registered username. Entering an invalid username will display an error, requiring you to input a valid username.

**NOTE:** In case you want to use another account, please navigate to the iLMS Register Menu.

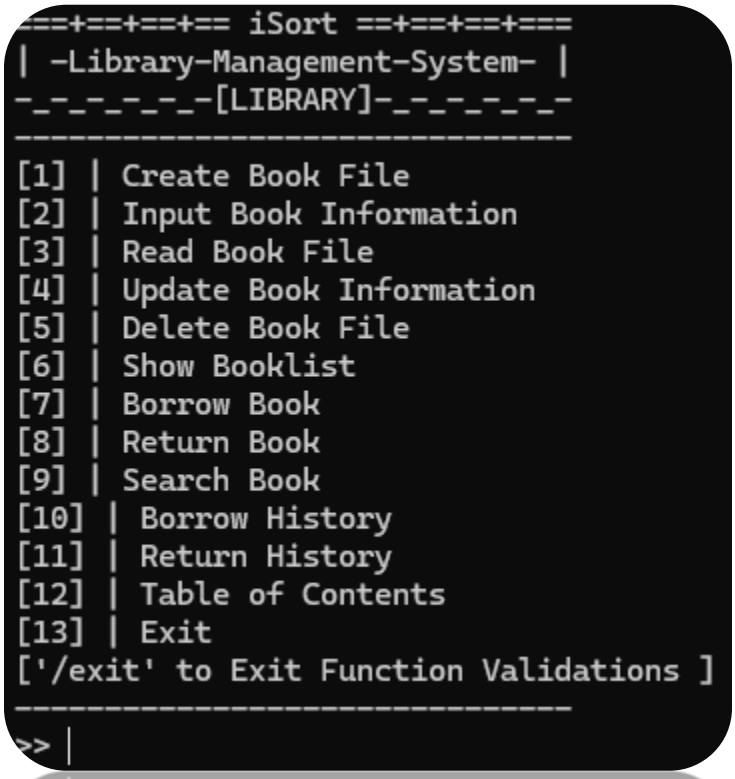
7. After entering a valid username, you will be asked to enter your password. Entering an incorrect password will display an error, requiring you to input a valid password.



8. After entering your username and password, the program will say that your account login was successful and will direct you to the iLMS Library Menu.




9. The iLMS Library Menu will display a wide variety of functions, 13 to be exact. In order to use a function, enter the 'number' only in the console.




**NOTE:** Enter '/exit' to exit the function validations

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**NOTE:** Entering any input other than numbers 1-13 or the '/exit' will display an error saying that your input is invalid and not recognized. Then, you will be asked to return to the menu. Enter 'y' to go back to the iLMS Library Menu or 'n' to exit the system.

```
------------------------------
>> invalid_input

Invalid Input. Please try again.
Return to menu[y/n]?:
```

Before using any of the functions, enter the number '12'. This will display the iLMS table of contents, displaying the functions list with its description(use/functionality).

```
---------------- FUNCTIONS --------------------
1. createBookfile() [C#1]
   - creates a book file(.txt) using bookTitle as filename

2. inputBookInformation() [C#2]
   - stores book details/information inside book file using validated information input
   - after validation, book is added to book list

3. readBookfile() [R]
   - reads book file line-by-line

4. updateBookInformation() [U]
   - edits/updates one book detail/information inside book file

5. deleteBookfile() [D]
   - deletes book file and is removed from the book list

6. showBooklist()
   - displays book list /w proper format (book_title[book_ISBN])

7. borrowBook()
   - book is transferred to 'borrowed_books' folder, is transcripted to 'borrow_history', and availability is set to 'No
'

8. returnBook()
   - book is transferred back to the 'main' folder, is transcripted to 'return_history', and availability is set back to
 'Yes'

9. searchBook()
   - locates book(if exists), displays ISBN, and suggests to show book file content

10. printBorrowHistory()
   - prints transcript of borrow_history from start to current, formatted along with borrow date

11. printReturnHistory()
   - prints transcript of return_history from start to current, formatted along with return date

>> /exit
   - exits the loop validation

Return to menu[y/n]?:
```

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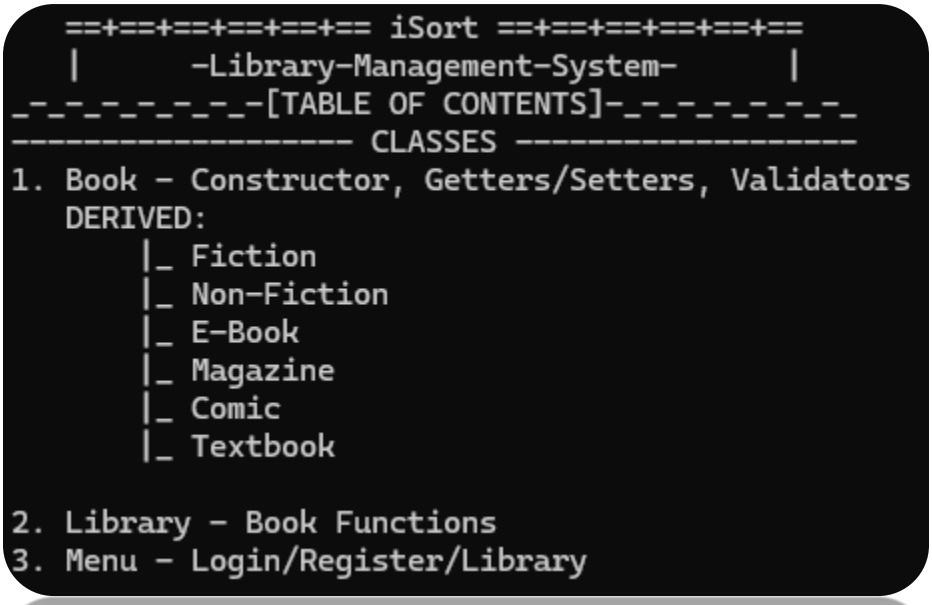
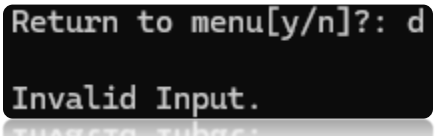
**NOTE:** Displaying the table of contents will also display the "classes" used, both base and derived, and how it is used in the program(for developers/programmers only).




10. After reading the table of contents, you will be asked to return to the menu. Again, enter 'y' to go back to the iLMS Library Menu or 'n' to exit the system.

**NOTE:** After using the systems' functions, you will always be asked if you want to return to the Library Menu. Only enter 2 inputs('y'/'n'), otherwise, displaying an error saying that your input is invalid.



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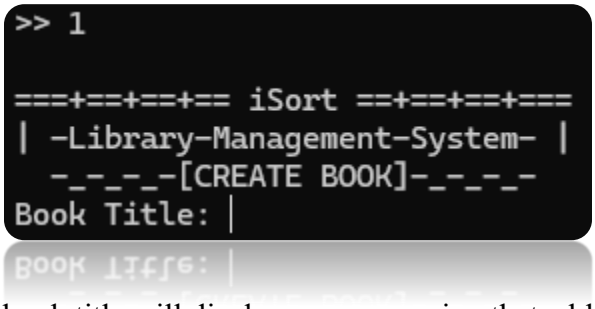
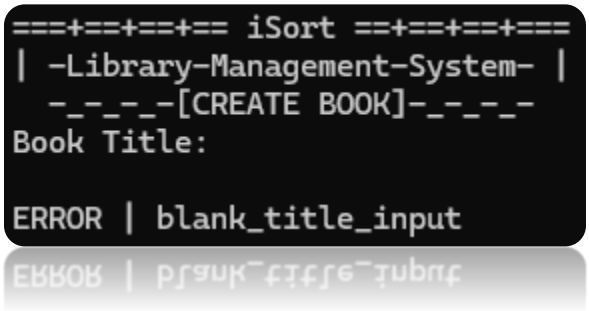
11. Now, you are ready to use iLMS. But before using the systems' sub-functions, let's run through using the C.R.U.D. Method. Firstly, enter '1' to create a bookfile. This will direct you to the iLMS Create Book Function Menu. You will be prompted to enter a book title. Enter a valid book title in order to create the book file.

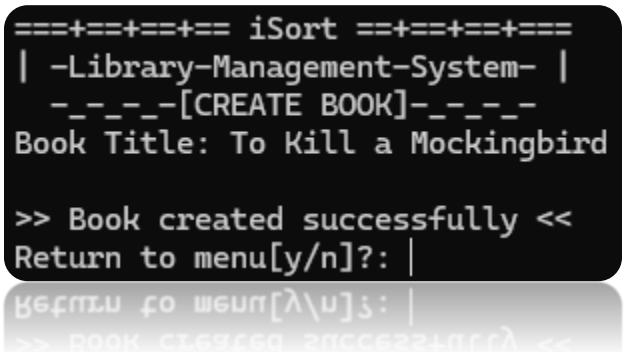



**NOTE:** Entering a blank book title will display an error saying that a blank book title is not allowed.




12. After entering a valid book title, a book file(.txt) will be created in your "txt_files" folder. The file name of the book file will be the book title you entered.

**NOTE:** The book file is not yet fully created; you still need to input information using the next function(inputBookInformation()).



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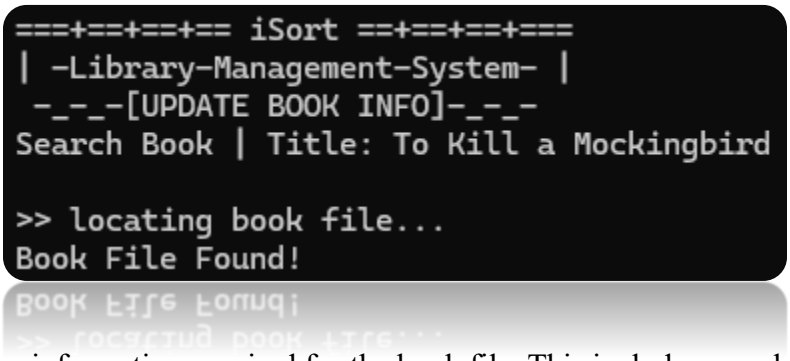
13. After creating a book file(CREATE Operation), go back to the iLMS Library Menu and enter '2' to input book information. The program will prompt you to search for the book file using the book title. Entering a valid and existing book file will then allow you to input the book's information.




14. Enter all the information required for the book file. This includes your book author, book genre, book ISBN(10-Digit), book publication date, book edition, book language, # of pages, and content. Keep in mind the necessary validation constrictions needed to be followed while entering inputs.

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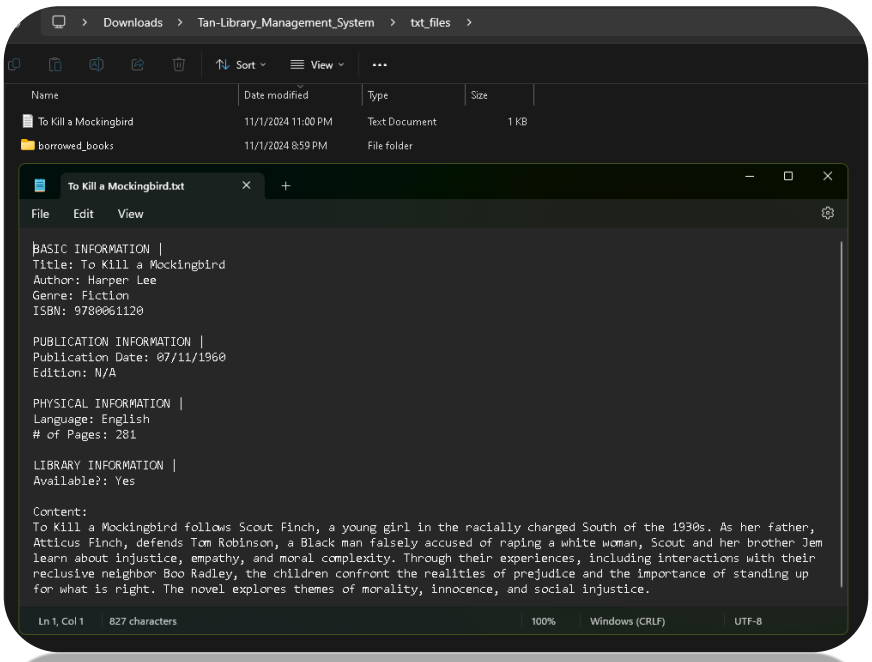
15. After successfully entering all the book file's information, the program will update the basic information inside the book file(.txt). It will also read the book file's content for easy access.

Book_File.txt →

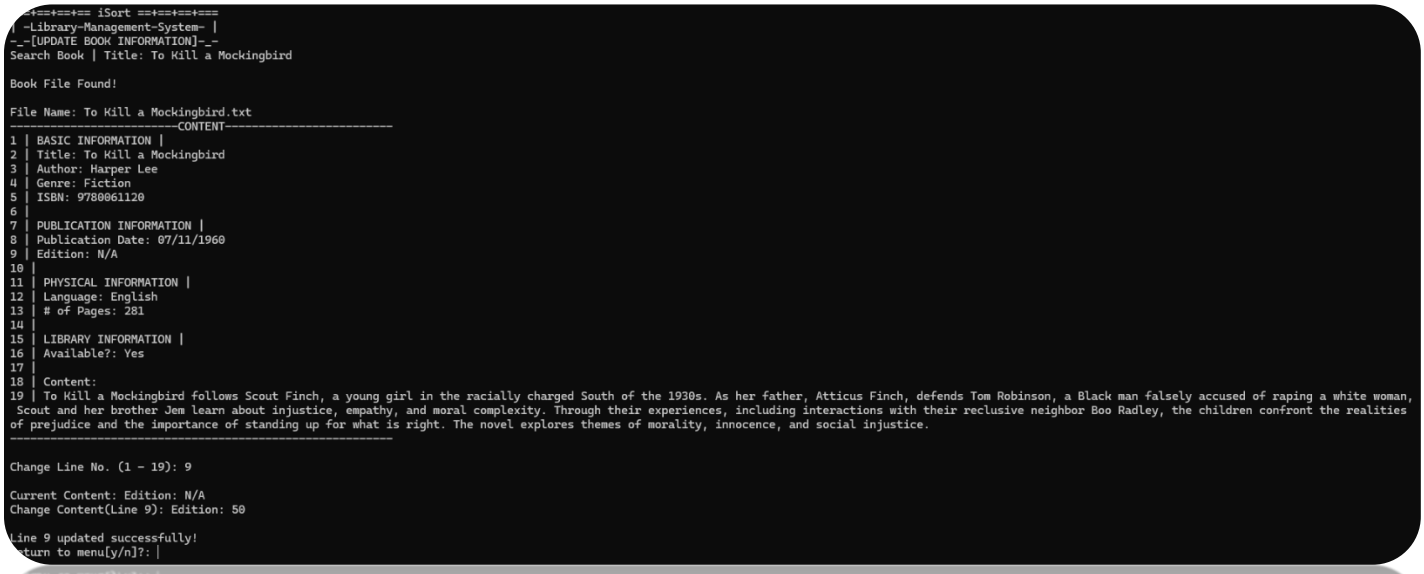



Book File is Read ↓

```
>> updating basic information in book file...
>> reading book file...
Book File Found!
BASIC INFORMATION |
Title: To Kill a Mockingbird
Author: Harper Lee
Genre: Fiction
ISBN: 9780061120

PUBLICATION INFORMATION |
Publication Date: 07/11/1960
Edition: N/A

PHYSICAL INFORMATION |
Language: English
# of Pages: 281

LIBRARY INFORMATION |
Available?: Yes

Content:
To Kill a Mockingbird follows Scout Finch, a young girl in the racially charged South of the 1930s. As her father, Atticus Finch, defends Tom Robinson, a Black man falsely accused of raping a white woman, Scou
t and her brother Jem learn about injustice, empathy, and moral complexity. Through their experiences, including interactions with their reclusive neighbor Boo Radley, the children confront the realities of pr
ejudice and the importance of standing up for what is right. The novel explores themes of morality, innocence, and social injustice.

Return to menu[y/n]?: |
```

16. After entering the book file's information(CREATE Operation), go back to the iLMS Library Menu and enter '4' to update book information. The program will prompt you to search for the book file to update using the book title. If the book file is existing and found, it displays the name of book file along with its content line-by-line. You are then prompted to enter a line number to change/modify.

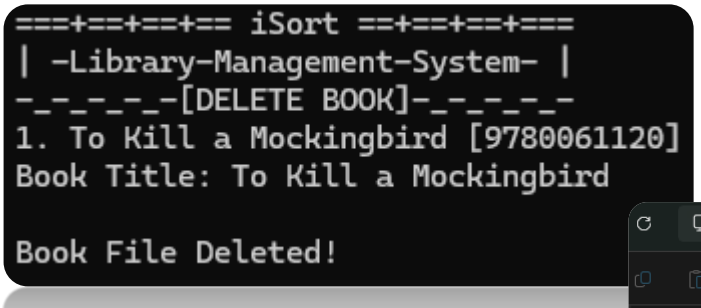
**NOTE:** In this example, the line no. 9 was entered, which will modify the edition of the book file. The current line content is displayed, and you are prompted to enter the new content. In this test case, I modified the Edition to "50".



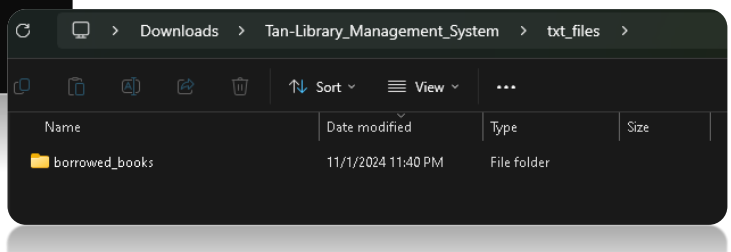
# iSort
# LIBRARY MANAGEMENT SYSTEM
# (iSort LMS v2.3)

17. After updating the book file's information(UPDATE Operation), go back to the iLMS Library Menu and enter '3' to read the book file. The program will display the list of available books in the system, prompting you to search for the book file to read using the book title. Entering a valid and existing book file will then allow you to read the book's information line-by-line.


18. After reading the book file's information(READ Operation). Go back to the iLMS Library Menu and enter '5' to delete the book file. The program will display the list of available books in the system, prompting you to search for the book file to read using the book title. Entering a valid and existing book file will then allow you to delete the book file, completely removing it from the system.




Book File is Deleted

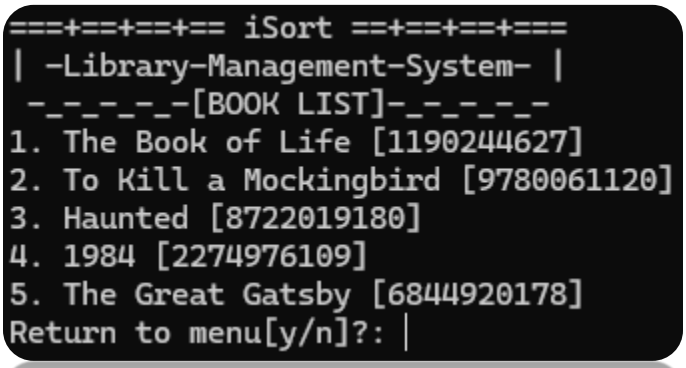


# iSort
# LIBRARY MANAGEMENT SYSTEM
# (iSort LMS v2.3)

19. After deleting the book file(DELETE Operation), you are now ready to use the sub-functions. Go back to the iLMS Library Menu. There, you can see the sub-functions(6-12), which accomplish a wide variety of tasks. These functions are…:

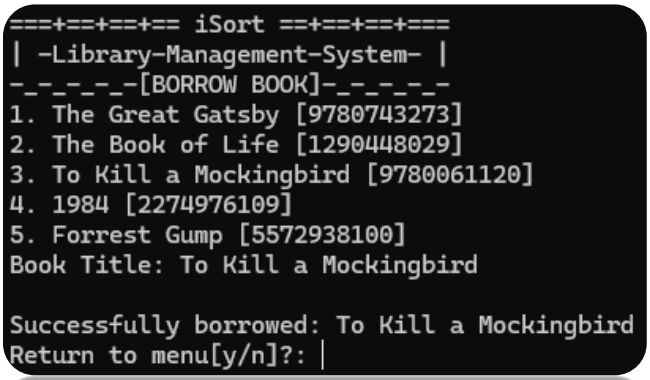
[6] || Show Booklist

- Shows the booklist, which includes "system verified" added books. The ISBN is displayed along with its corresponding book title.




[7] || Borrow Book

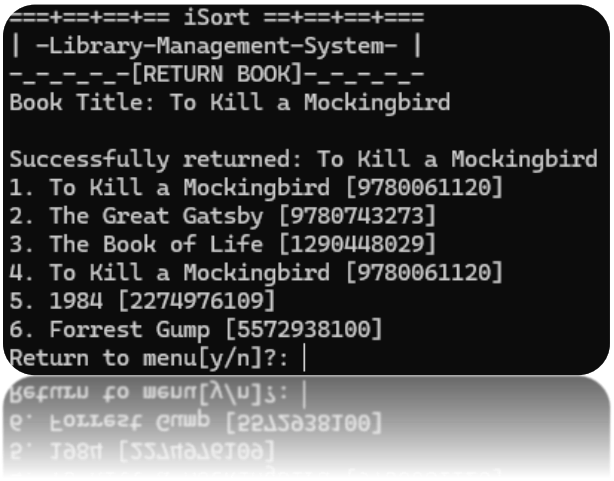
- Shows the booklist, and prompts you to search for the book file to borrow using the book title. Entering a valid and existing book file will then allow you to borrow the book file, transferring its folder location from the "txt_files" main folder, to the "borrowed_books" folder, and setting its availability to 'No'.



# iSort
# LIBRARY MANAGEMENT SYSTEM
# (iSort LMS v2.3)

[8] || Return Book

- Shows the booklist, and prompts you to search for the book file to return using the book title. Entering a valid and existing book file will then allow you to return the book file, transferring its folder location from the "borrowed_books" folder to the "txt_files" main folder, and setting its availability to 'Yes'.



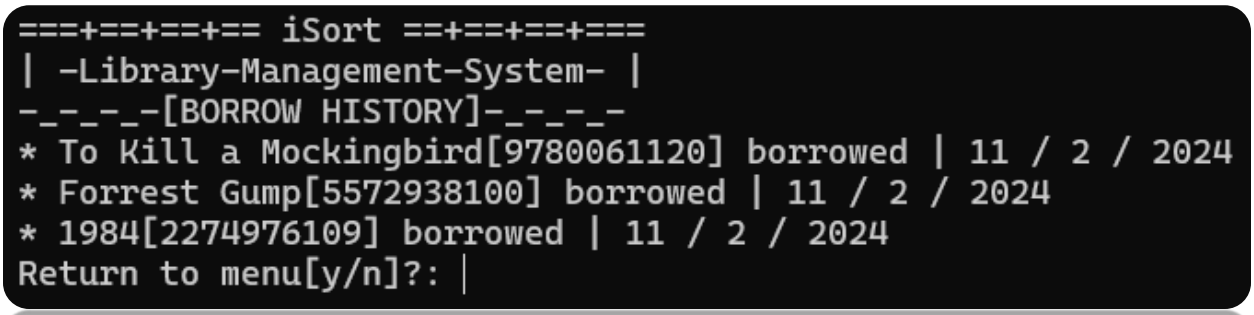

[9] || Search Book

- Shows the booklist, and prompts you to search for the book file to return using the book title. Entering a valid and existing book file will then display the book title along with its ISBN. It will also suggest you to show the book file's contents. Enter '1' to read file or '2' to finish search.

# iSort
# LIBRARY MANAGEMENT SYSTEM
# (iSort LMS v2.3)

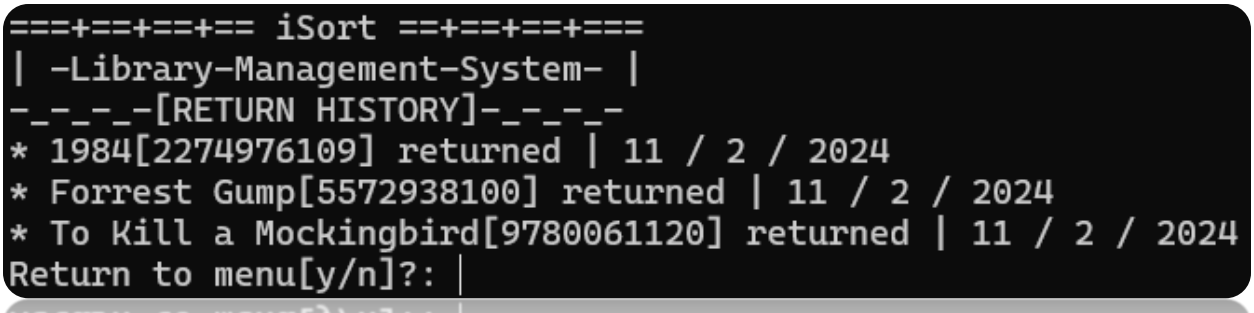
[10] || Borrow History

- Shows a transcript of the borrow history of a book file, displaying its title, ISBN, and borrow date




[11] || Return History

- Shows a transcript of the return history of a book file, displaying its title, ISBN, and return date



# iSort
# LIBRARY MANAGEMENT SYSTEM
# (iSort LMS v2.3)

[12] || Table of Contents

- Shows Table of Content(Classes & Functions) with a short description

```
------------------- FUNCTIONS --------------------
1. createBookfile() [C#1]
   - creates a book file(.txt) using bookTitle as filename

2. inputBookInformation() [C#2]
   - stores book details/information inside book file using validated information input
   - after validation, book is added to book list

3. readBookfile() [R]
   - reads book file line-by-line

4. updateBookInformation() [U]
   - edits/updates one book detail/information inside book file

5. deleteBookfile() [D]
   - deletes book file and is removed from the book list

6. showBooklist()
   - displays book list /w proper format (book_title[book_ISBN])

7. borrowBook()
   - book is transferred to 'borrowed_books' folder, is transcripted to 'borrow_history', and availability is set to 'No'

8. returnBook()
   - book is transferred back to the 'main' folder, is transcripted to 'return_history', and availability is set back to 'Yes'

9. searchBook()
   - locates book(if exists), displays ISBN, and suggests to show book file content

10. printBorrowHistory()
   - prints transcript of borrow_history from start to current, formatted along with borrow date

11. printReturnHistory()
   - prints transcript of return_history from start to current, formatted along with return date

>> /exit
   - exits the loop validation
```

## 6. Program Limitations

**Bugs/Issues:**

- Borrowing a book that has no information set

You can borrrow a book that has no information input(which is regarded as invalid) and displays and error code *0xC0000005*, which is an "access violation". A book file must have information before it is borrowed/returned.

**NOTE:** This list had more than 1 issues but were fixed accordingly by the developer.

**Challenges in Development Phase:**

- Creating a text file and linking it to the virtual book in the system

It was my first time creating a text file using the fstream, and I had to study it for an hour in order to properly utilize it. I had difficulties troubleshooting my system, but eventually I've created a text file for my iLMS.

- Moving the text file's directory

It was also my first time manipulating a file's directory, so I had to study for another 2 hours or so in order to understand the concept and use the function properly. I used the rename function in order to move the book file from my main folder(txt_files) to another folder inside it, which is the "borrowed_books" folder. Even though the purpose of the rename function is to change its file name, it also satisfies the task of moving file directories.

- Book's Content

At first, I didn't know inputting strings had  limitations. I've just then found out through research that the character limit of inputting strings is approximately 2000 characters. So I had to think of a way to limit the input of the user. I estimated it to be of 300 words for the content. I then thought of a way to end the input loop, which is to use a sentinel. I thought of a special character that is never used in books' content, which is the '|' symbol. Line breaks are also not allowed for a compact format.

## 7. References

Clion (n.d.). CLion: A cross-platform IDE for C and C++. Jetbrains. https://www.jetbrains.com/clion/