CA 3: Experiential Learning

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Problem Statement:

Objective:

Develop a C++ program for a Library Management System that enables librarians to add books and Magazines,, members to borrow and return books, and provides library cards. The system should maintain book availability, member records, and history, and handle errors gracefully.

Scope:

Add, display, borrow, and return books. Generate library cards for members. Register members with unique IDs. Use a user-friendly menu interface for easy navigation. Your task is to create a functional and well-documented program that efficiently manages library resources and book transactions.

Explanation:

This C++ program implements a Library Management System, designed to facilitate the management of books and library members. The system is structured around the following key features:

1. Adding Books/Magazines:

Librarians can add books to the library, specifying the title, author, and quantity. Each book is assigned a unique ID.

2. Displaying Books and Magazines:

The system allows for the display of available books, showing details such as titles, authors, availability status, and due dates for borrowed books.

3. Borrowing Books:

Members can borrow books from the library. Borrowed books are updated with borrower information and due dates.

4. Returning Books:

Members can return books, and late fees are calculated for overdue books. The system maintains borrowing history.

5. Printing Library Cards:

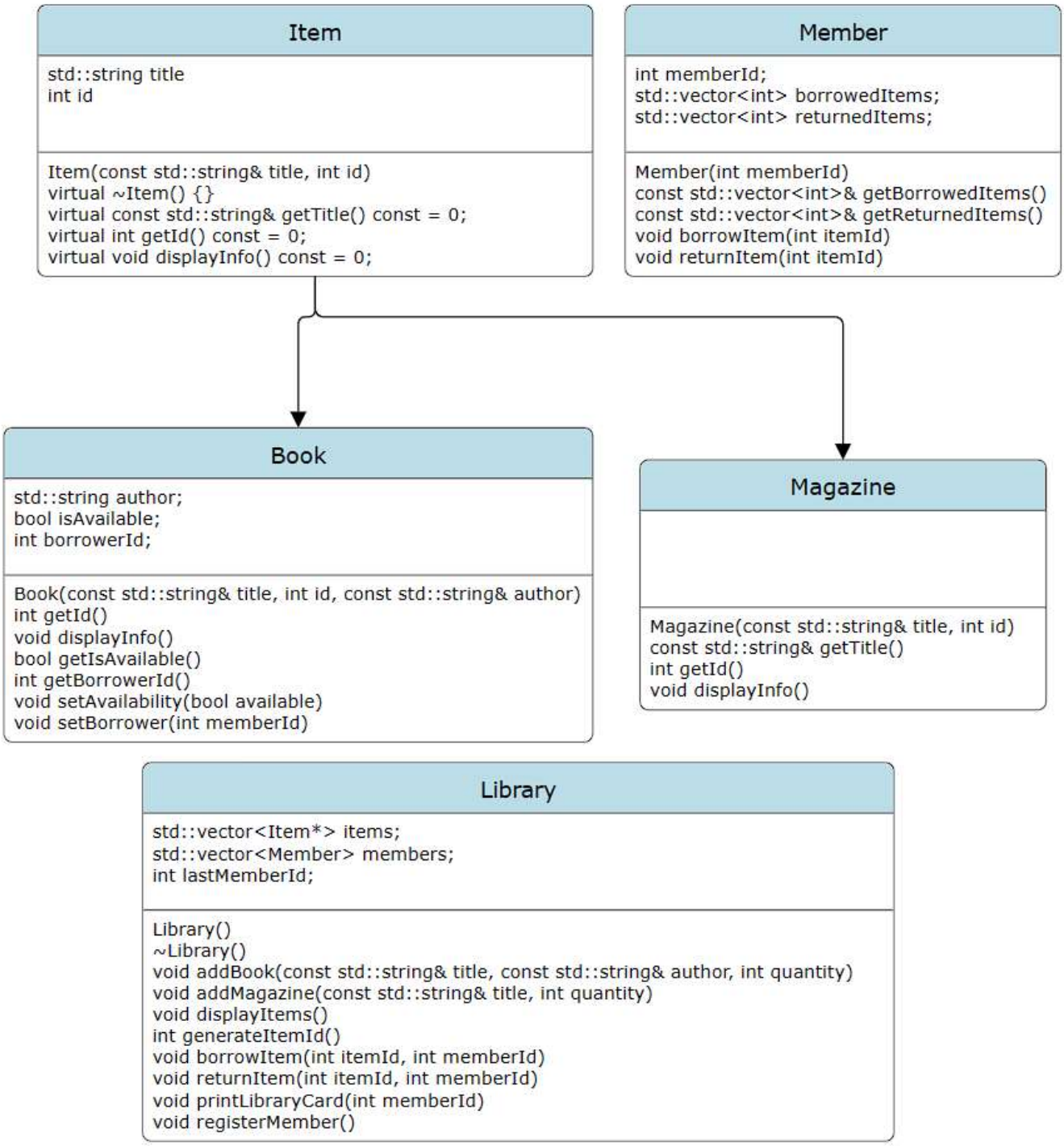
Members can generate library cards, displaying currently borrowed books and borrowing history, including titles, authors, book IDs, due dates, and return dates if applicable.

6. Registering Members:

Librarians can register new members, each with a unique member ID for book transactions.

The program provides a user-friendly menu system for easy navigation and includes error handling to guide users in case of invalid inputs or unavailable books.

Class Diagram:



Code snippets:

Inheritance:

The class Item has 2 data members ‘string title’ and ’int id’.

```
class Item {
    protected:
        std::string title;
        int id;
    public:
    //Other Member functions

};
```

The class Item is Inherited by two classes, ‘Book’ and ‘Magazine’.

```
class Book : public Item {
    private:
        std::string author;
        bool isAvailable;
        int borrowerId;
    public:
        //Other Member functions
};
```

```
class Magazine : public Item {
    //class Magazine has no specific data members of its own,
    //as they are already included in class Item.
    public:
    //Other Member functions
};
```

Polymorphism:

```
for (const auto& item : items) {
    item->displayInfo();
}
```

In this snippet, items is a vector of pointers to the base class Item. Despite holding objects of various types, including Book and Magazine, the displayInfo function is called on each item. Due to the use of virtual functions in the base class Item, the appropriate displayInfo function in the derived class (e.g., Book or Magazine) is invoked at runtime based on the actual type of the object. This is polymorphism in action, where the same interface is used to perform different actions depending on the specific object type.

Some More Examples:

```
    virtual ~Item() {}
    virtual const std::string& getTitle() const = 0;
    virtual int getId() const = 0;
    virtual void displayInfo() const = 0;
```

These all functions are getting overridden showing polymorphism in class Item, Book and Magazine.

Input/Output:

```
Library Management System Menu:
1. Display Items
2. Borrow Item
3. Return Item
4. Add Book
5. Add Magazine
6. Register Member
7. Print Library Card
8. Exit
Enter your choice: 4
Enter book title: Harry Potter
Enter book author: J. K. Rowling
Enter quantity: 5
Book added successfully. ID: 1
Book added successfully. ID: 2
Book added successfully. ID: 3
Book added successfully. ID: 4
Book added successfully. ID: 5

Library Management System Menu:
1. Display Items
2. Borrow Item
3. Return Item
4. Add Book
5. Add Magazine
6. Register Member
7. Print Library Card
8. Exit
Enter your choice: 5
Enter magazine title: SIT, Pune 2023 Edition
Enter quantity: 10
Magazine added successfully. ID: 6
Magazine added successfully. ID: 7
Magazine added successfully. ID: 8
Magazine added successfully. ID: 9
Magazine added successfully. ID: 10
Magazine added successfully. ID: 11
Magazine added successfully. ID: 12
Magazine added successfully. ID: 13
Magazine added successfully. ID: 14
Magazine added successfully. ID: 15
```

```
Library Management System Menu:
1. Display Items
2. Borrow Item
3. Return Item
4. Add Book
5. Add Magazine
6. Register Member
7. Print Library Card
8. Exit
Enter your choice: 1
Library Items:
```

ID	Title	Author	Availability
1	Harry Potter	J. K. Rowling	Yes
2	Harry Potter	J. K. Rowling	Yes
3	Harry Potter	J. K. Rowling	Yes
4	Harry Potter	J. K. Rowling	Yes
5	Harry Potter	J. K. Rowling	Yes
6	SIT, Pune 2023 Edition	N/A	Yes
7	SIT, Pune 2023 Edition	N/A	Yes
8	SIT, Pune 2023 Edition	N/A	Yes
9	SIT, Pune 2023 Edition	N/A	Yes
10	SIT, Pune 2023 Edition	N/A	Yes
11	SIT, Pune 2023 Edition	N/A	Yes
12	SIT, Pune 2023 Edition	N/A	Yes
13	SIT, Pune 2023 Edition	N/A	Yes
14	SIT, Pune 2023 Edition	N/A	Yes
15	SIT, Pune 2023 Edition	N/A	Yes

```
Library Management System Menu:
1. Display Items
2. Borrow Item
3. Return Item
4. Add Book
5. Add Magazine
6. Register Member
7. Print Library Card
8. Exit
Enter your choice: 6
Member registered successfully. Member ID: 1001

Library Management System Menu:
1. Display Items
2. Borrow Item
3. Return Item
4. Add Book
5. Add Magazine
6. Register Member
7. Print Library Card
8. Exit
Enter your choice: 2
Enter the ID of the item you want to borrow: 3
Enter your Member ID: 1001
Item with ID 3 borrowed successfully by Member ID 1001.
```

```
Library Management System Menu:
1. Display Items
2. Borrow Item
3. Return Item
4. Add Book
5. Add Magazine
6. Register Member
7. Print Library Card
8. Exit
Enter your choice: 3
Enter the ID of the item you want to return: 3
Enter your Member ID: 1001
Item with ID 3 returned successfully by Member ID 1001.

Library Management System Menu:
1. Display Items
2. Borrow Item
3. Return Item
4. Add Book
5. Add Magazine
6. Register Member
7. Print Library Card
8. Exit
Enter your choice: 7
Enter Member ID to print library card: 1001
Library Card for Member ID 1001:
Borrowed Items:
-----------------------------------------------
|   ID |         Title             |   Status   |
-----------------------------------------------
|    3 |             Harry Potter |            |
|    3 |             Harry Potter |   Returned |
-----------------------------------------------

Library Management System Menu:
1. Display Items
2. Borrow Item
3. Return Item
4. Add Book
5. Add Magazine
6. Register Member
7. Print Library Card
8. Exit
Enter your choice: 8
Exiting the program.
```

Github repository link:

Ishaan453/SEM3-PPL-Project (github.com)