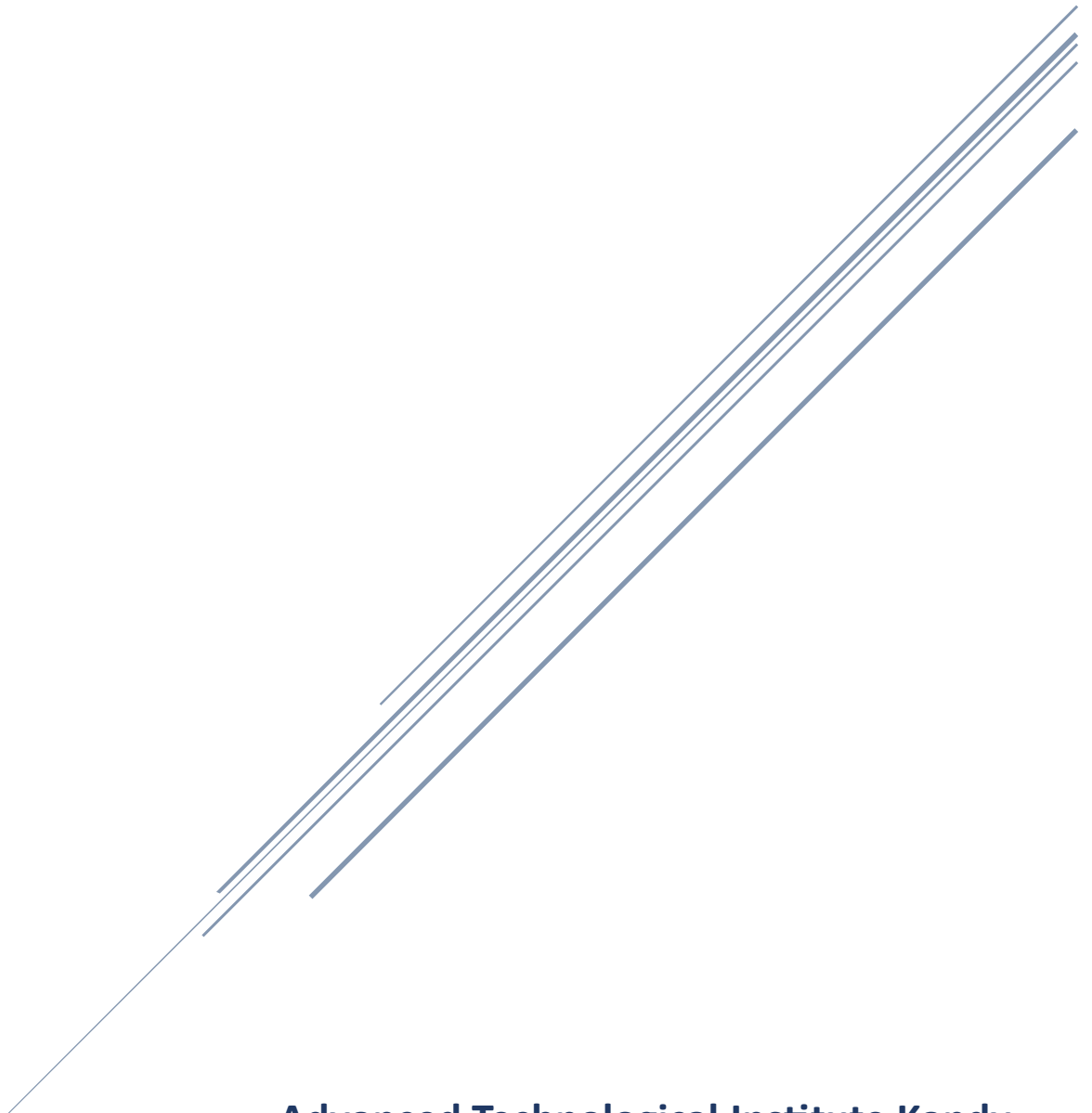


LIBRARY MANAGEMENT SYSTEM

KAN/IT/2022/F/0072

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1. Introduction

The Library Management System (LMS) is a Java-based application designed to manage books and members in a library. It provides a graphical user interface (GUI) for easy interaction and adheres to the Model-View-Controller (MVC) architecture for organized code management. The system implements object-oriented programming (OOP) concepts such as encapsulation, inheritance, polymorphism, abstraction, and exception handling.

2. System Architecture

The LMS is developed using the MVC design pattern:

- **Model Layer:** Represents the data and business logic of the application. Classes include `Admin`, `Member`, `MembershipCard`, `Book`, and `Author`.
- **View Layer:** Contains GUI components to display the application's interface. Classes include `Login`, `EditBooks`, `EditMember`, and `View`.
- **Controller Layer:** Handles the interactions between the Model and View layers. Classes include `AdminController`, `BookController`, and `MemberController`.

The application structure ensures modularity, scalability, and ease of maintenance.

3. Object-Oriented Programming Concepts

- **Encapsulation:** Private fields with public getters and setters are used in the `Book`, `Member`, and `MembershipCard` classes to protect data.
- **Inheritance:** The `User` class serves as a base class for `Admin` and `Member`.
- **Polymorphism:** The `displayDetails()` method is overridden in `Book` and `Member` classes to provide specific implementations.
- **Abstraction:** Interfaces or abstract classes (if used) define common behaviors.
- **Aggregation:** A `Book` is associated with multiple `Member` objects but exists independently.
- **Composition:** The `MembershipCard` class is part of the `Member` class, indicating a strong relationship.

4. Features and Functional Requirements

1. **Login System:**
 - Authenticates users as `Admin` or `Member`.
 - Provides different privileges based on roles.
2. **Member Management:**
 - Admin can add, update, delete, and view member details.
 - Each member has a `MembershipCard` containing details like card number and expiration date.

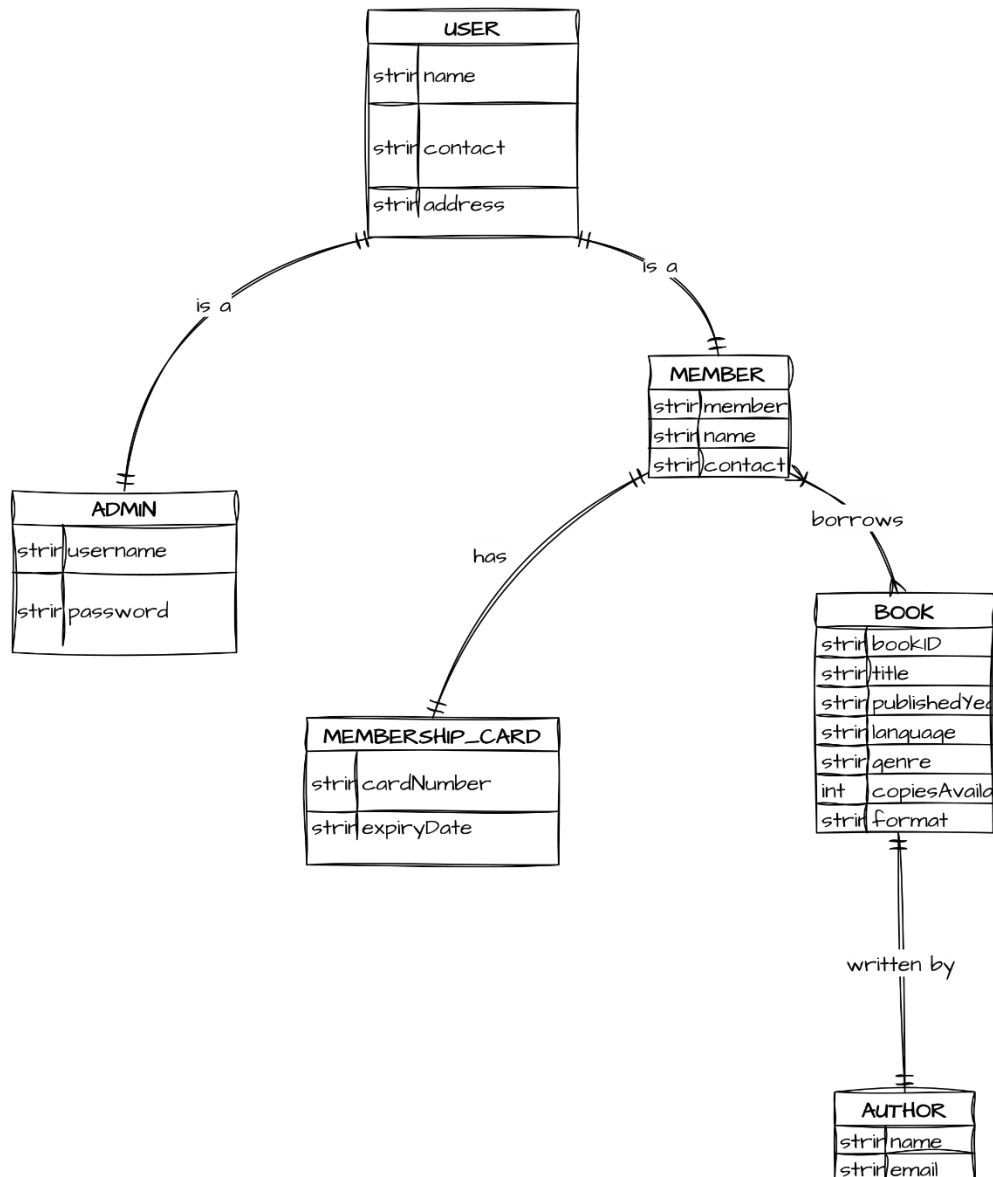
3. Book Management:

- Admin can add, update, delete, and view book details.
- Users can search books using overloaded methods:
 - `searchBooks(String title)`
 - `searchBooks(String title, String author)`

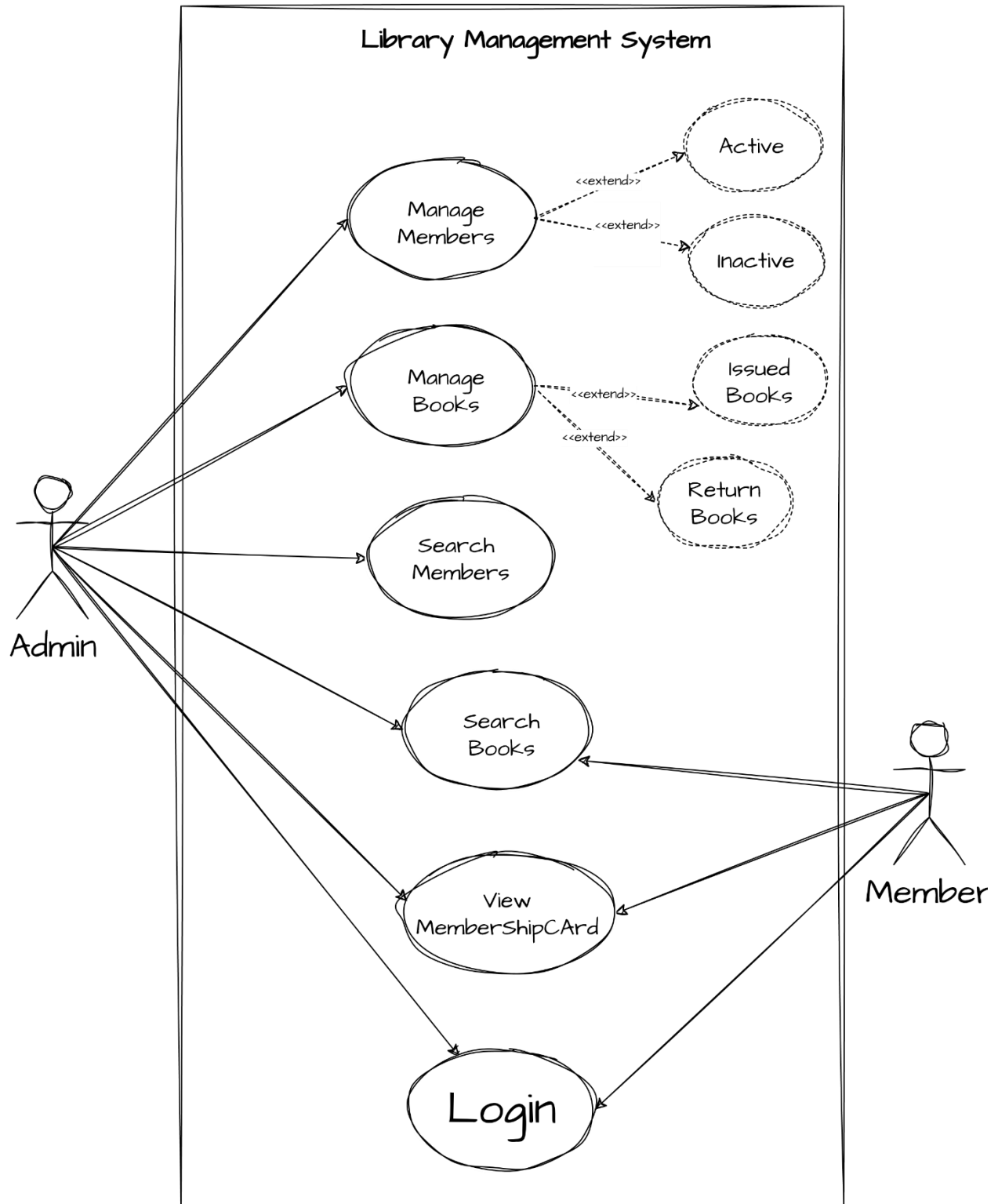
4. Exception Handling:

- Handles invalid login attempts, empty form submissions, and unauthorized access.

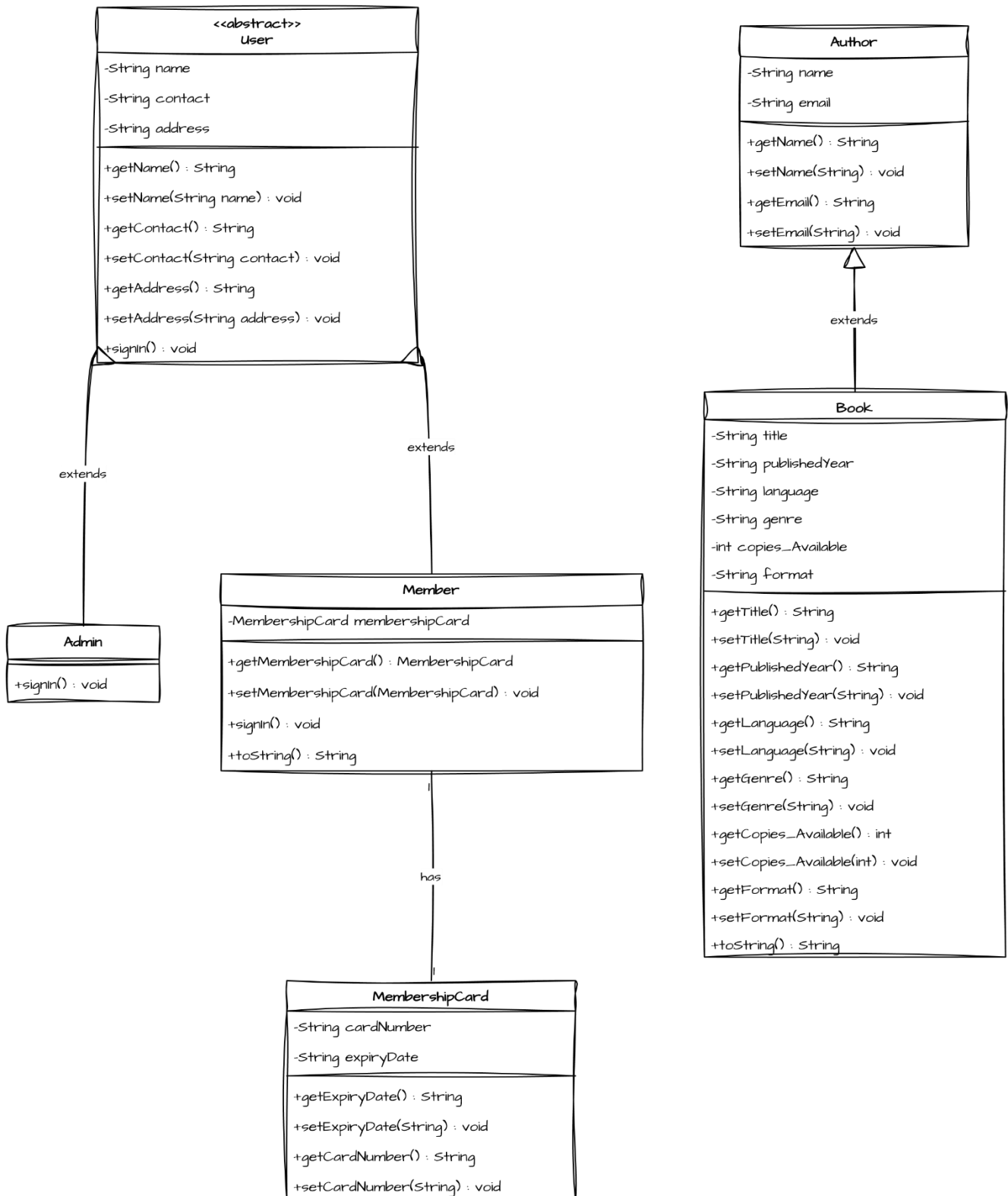
5. Entity-Relationship Diagram



6. Use Case Diagram



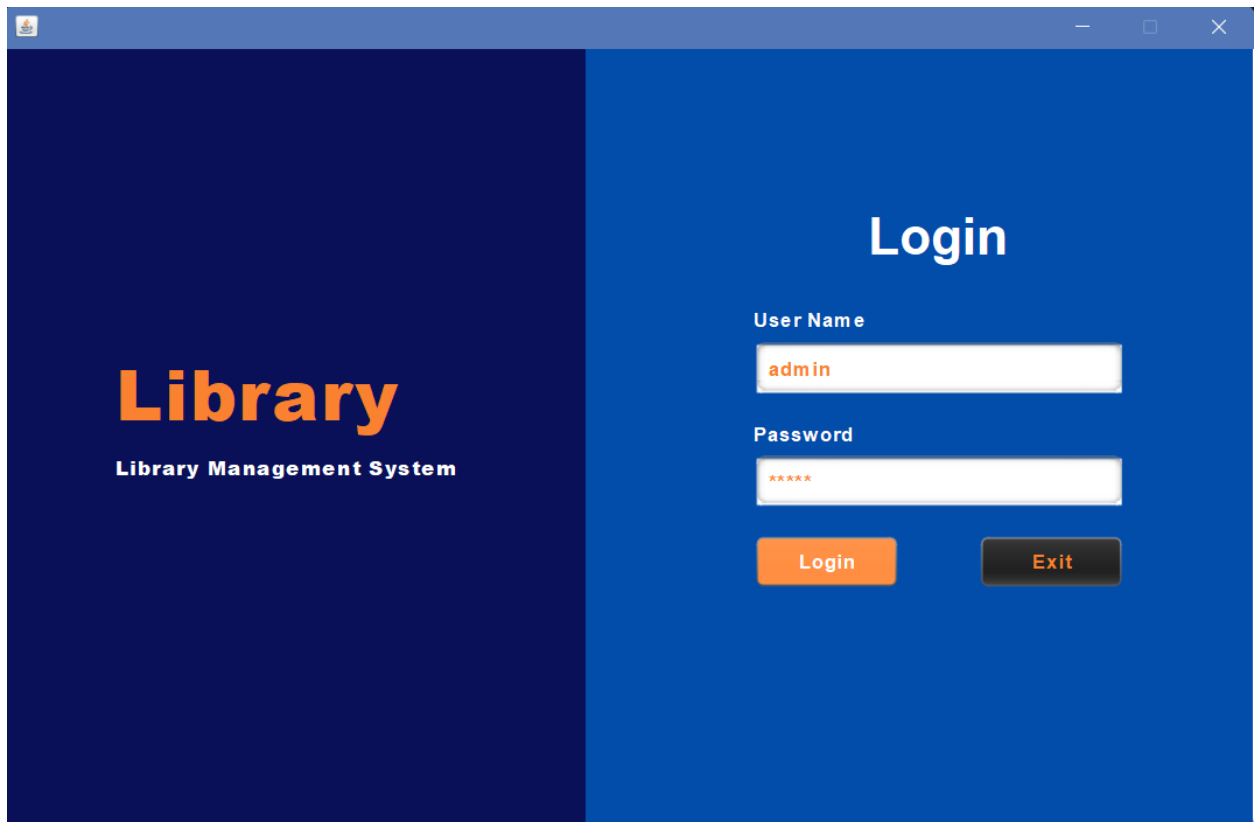
7. Class Diagram



8. User Manual

Login

- Launch the application.
- Enter the username and password.
- Click "Login." Admin users access full features, while Members access limited features.



The screenshot shows a window titled "Library Management System" with a dark blue background on the left and a lighter blue background on the right. The left side displays the word "Library" in large orange letters and "Library Management System" in white below it. The right side is titled "Login" in white. It contains two input fields: "User Name" with the text "admin" and "Password" with masked characters "*****". Below these fields are two buttons: an orange "Login" button and a dark grey "Exit" button.

Library
Library Management System

Login

User Name
admin

Password

Login Exit

9. Member Management:

1. Navigate to "Manage Members" (Admin only).
2. Use the "Add," "Edit," or "Active" or "Inactive" buttons to perform actions.

Library

Management System

Members

Books

Edit Member

Edit Books

Issued Books

Return Books

Search Member

Member Manager

ID	Name	Contact	Address	Course	expire_date	Status
34	John Doe	0771234567	123 Main Street, Colombo	High National Diploma Informatio	2025-01-01 12:00:00	active
35	Jane Smith	0779876543	456 Elm Street, Kandy	High National Diploma Accountin	2025-05-15 12:00:00	active
37	Nimal Silva	0787654321	101 Rose Avenue, Matara	High National Diploma Tourism	2024-12-15 12:00:00	active
39	Amara Wijesinghe	0781234567	303 Lily Road, Negombo	High National Diploma Informatio	2025-07-10 12:00:00	active
40	Kamal Jayasuriya	0759876543	404 Jasmine Street, Kurunegala	High National Diploma Accountin	2025-11-25 12:00:00	active
42	Dinesh Karunaratne	0717654321	606 Marigold Lane, Batticaloa	High National Diploma Tourism	2025-02-14 12:00:00	active

Name

Contact

Address

Course

High National Diploma Information Technology

Expire date

Add

View All

Active

InActive

SyncState

10. Book Management:

1. Navigate to "Manage Books" (Admin only).
2. Search books by title or title and author.

Library

Management System

- Members
- Books
- Edit Member
- Edit Books
- Issued Books
- Return Books

Search Book

Book Manager

ID	Title	Author	Year	Language	Genre	Copies	Format
3	Madolduwa	Martin Wickramasinghe	1947	Sinhala	Adventure	25	Printed Book
4	Sherlock Holmes	Arthur Conan Doyle	1887	English	Mystery	30	Printed Book
5	To Kill a Mockingbird	Harper Lee	1960	English	Fiction	40	Printed Book
6	The Great Gatsby	F. Scott Fitzgerald	1925	English	Classic	35	PDF
7	Pride and Prejudice	Jane Austen	1813	English	Romance	20	Printed Book
8	1984	George Orwell	1949	English	Dystopian	45	Ebook
9	The Kite Runner	Khaled Hosseini	2003	English	Drama	15	Printed Book
10	The Alchemist	Paulo Coelho	1988	English	Fiction	30	Kindle
11	Life of Pi	Yann Martel	2001	English	Adventure	25	Printed Book
12	The God of Small Things	Arundhati Roy	1997	English	Fiction	20	Ebook
13	The Road	Comac McCarthy	2006	English	Post-Apocalyptic	40	PDF
14	Harry Potter and the Sorcerer's Stone	J.K. Rowling	1997	English	Fantasy	35	Printed Book
15	The Lord of the Rings	J.R.R. Tolkien	1954	English	Fantasy	30	Printed Book
16	The Book Thief	Markus Zusak	2005	English	Historical Fiction	20	Printed Book
17	A Brief History of Time	Stephen Hawking	1988	English	Science	25	Ebook
18	Siddhartha	Hermann Hesse	1922	English	Philosophy	25	PDF
19	Beloved	Toni Morrison	1987	English	Historical Fiction	15	Ebook
20	One Hundred Years of Solitude	Gabriel Garcia Márquez	1967	English	Magical Realism	30	Printed Book
21	The Catcher in the Rye	J.D. Salinger	1951	English	Classic	25	Printed Book
22	Crime and Punishment	Fyodor Dostoevsky	1866	English	Psychological Fiction	40	Printed Book

Book Title

Author

Publication year

Genre

Language

Format

Copies Available

PDF

Add

View All

11. Edit Book:

The screenshot shows the 'Edit Book' form in the Library Management System. The interface has a dark blue sidebar on the left with the title 'Library Management System' and a list of buttons: 'Books', 'Members', 'Edit Member', 'Edit Books', 'Issued Books', and 'Return Books'. The main area has a blue header with 'Edit Books' and a form with the following fields: 'Book ID', 'Book Title', 'Author', 'Language' (a dropdown menu showing 'English'), 'Copies Available', 'Genre' (a dropdown menu showing 'Adventure'), 'Format' (a dropdown menu showing 'PDF'), and 'Publication Year'. There are 'Save' and 'Close' buttons to the right of the form.

Book ID	<input type="text"/>	Save
Book Title	<input type="text"/>	Close
Author	<input type="text"/>	
Language	<input type="text" value="English"/>	
Copies Available	<input type="text"/>	
Genre	<input type="text" value="Adventure"/>	
Format	<input type="text" value="PDF"/>	
Publication Year	<input type="text"/>	

12. Edit Member:

The screenshot shows the 'Edit Member' form in the Library Management System. The interface is similar to the 'Edit Book' form, with a dark blue sidebar on the left containing the title 'Library Management System' and buttons for 'Books', 'Members', 'Edit Member', 'Edit Books', 'Issued Books', and 'Return Books'. The main area has a blue header with 'Edit Member' and a form with the following fields: 'Member ID', 'Name', 'Expire Date' (with a calendar icon), 'Contact', 'Course', and 'Address'. There are 'Save' and 'Close' buttons to the right of the form.

Member ID	<input type="text"/>	Save
Name	<input type="text"/>	Close
Expire Date	<input type="text"/>	
Contact	<input type="text"/>	
Course	<input type="text"/>	
Address	<input type="text"/>	

13. Issued Books:

Library
Management System

Members

Books

Edit Member

Edit Books

Issued Books

Return Books

Issued books

Title 1	Title 2	Title 3	Title 4	Title 5	Title 6	Title 7	Title 8
0	Sarah J...	BK1001	The Art ...	2024-11...	2024-12...		
0	Michael ...	BK1002	Data Str...	2024-11...	2024-12...		
0	Emily R...	BK1003	Digital ...	2024-11...	2024-12...		
0	David ...	BK1004	Financia ...	2024-11...	2024-12...		
0	Lisa Th...	BK1005	Project ...	2024-11...	2024-12...		
35	Jane S...	6	The Gre...	2024-11...	2024-12...		

ID	Name	Contact	Address	Course	expire_date	Status
34	John Doe	0771234567	123 Main Street, ...	High National Dipl...	2025-01-01 12:00...	active
35	Jane Smith	0779876543	456 Elm Street, K...	High National Dipl...	2025-05-15 12:00...	active
37	Nimal Silva	0787654321	101 Rose Avenue...	High National Dipl...	2024-12-15 12:00...	active
39	Amara Wijesinghe	0701234567	303 Lily Road, Ne...	High National Dipl...	2025-07-10 12:00...	active
40	Kamal Jayasuriya	0759876543	404 Jasmine Stre...	High National Dipl...	2025-11-25 12:00...	active
42	Dinesh Karunarat...	0717654321	600 Mangold Lan...	High National Dipl...	2025-02-14 12:00...	active

ID	Title	Author	Year	Language	Genre	Copies	Format
3	Madolduwa	Martin Wickra...	1947	Sinhala	Adventure	25	Printed Book
4	Sherlock Hol...	Arthur Conan ...	1887	English	Mystery	30	Printed Book
5	To Kill a Mocki...	Harper Lee	1960	English	Fiction	40	Printed Book
6	The Great Gat...	F. Scott Fitzge...	1925	English	Classic	35	PDF
7	Pride and Prej...	Jane Austen	1813	English	Romance	20	Printed Book
8	1984	George Orwell	1949	English	Dystopian	45	Ebook
9	The Kite Runn...	Khaled Hossei...	2003	English	Drama	15	Printed Book

Member ID

Member Name

Book ID

Book Title

Issue Date

Due Date

Save

14. Issued Books:

Library
Management System

Members

Books

Edit Member

Edit Books

Issued Books

Return Books

Returned books

Title 1	Title 2	Title 3	Title 4	Title 5	Title 6	Title 7	Title 8
35	Jane Smith	6	The Great...	0.0	2024-12-20	2024-12-24	2024-11-24
34	John Doe	7	Pride and ...	100.0	2024-11-30	2025-01-01	2024-11-15
36	Ravi Pene...	10	The Alche...	0.0	2024-12-01	2024-12-15	2024-11-20
37	Nimal Sil...	14	Harry Pot...	200.0	2024-11-28	2024-12-10	2024-11-10
40	Kamal Ja...	5	To Kill a M...	0.0	2024-12-05	2024-12-20	2024-11-25

Title 1	Title 2	Title 3	Title 4	Title 5	Title 6	Title 7	Title 8
0	Sarah Johns...	BK1001	The Art of Pr...	2024-11-20	2024-12-20		
0	Michael Chen	BK1002	Data Structu...	2024-11-21	2024-12-21		
0	Emily Roddy...	BK1003	Digital Marko...	2024-11-22	2024-12-22		
0	David Wilson	BK1004	Financial Ma...	2024-11-23	2024-12-23		
0	Lisa Thomps...	BK1005	Project Mana...	2024-11-24	2024-12-24		
35	Jane Smith	6	The Great G...	2024-11-24	2024-12-24		

Member ID

Member Name

Book ID

Book Title

Damage Fees

Return Date

Due Date

Issue Date

Condition on Return

Good - Rs.0

Save

15. Conclusion

The LMS provides a robust and efficient way to manage library operations, ensuring user-friendly interfaces and secure access. Future enhancements may include integrating a database for persistence and expanding member privileges.

