Vivekanand Education Society's Institute Of Technology
Department Of Information Technology
DSA miniProject
A.Y. 2025-26

Title:
Sustainability Goal :

Domain:

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1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
THE GLOBAL GOALS
For Sustainable Development
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE AND JUSTICE STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS

Content

Introduction to Project

The Library Fine Calculator is a system designed to automate the management of library books, members, and fines.
It simplifies issuing and returning books, automatically calculates due dates and fines, and predicts potential late returns using historical data.
The system improves library efficiency, reduces manual errors, and enhances member experience.

Enhanced Features:

- Automatic 14-day due date calculation for issued books
- AI-inspired fine prediction feature based on member history
- Persistent storage using binary files

Problem Statement

Design and implement a library management module that:

- Maintains records of books and members,
- Issues and returns books,
- Calculates fines based on overdue days,
- Stores data persistently,
- Uses appropriate data structures and displays time/space complexity.

Objectives of the project

- Manage books and member details efficiently
- Automate book issue and return processes
- Calculate fines based on delayed returns
- Store data permanently using file handling
- Predict member behavior using AI-inspired fine prediction
- Apply DSA concepts (arrays, structures, date algorithms) effectively

Requirements of the system (Hardware, software)

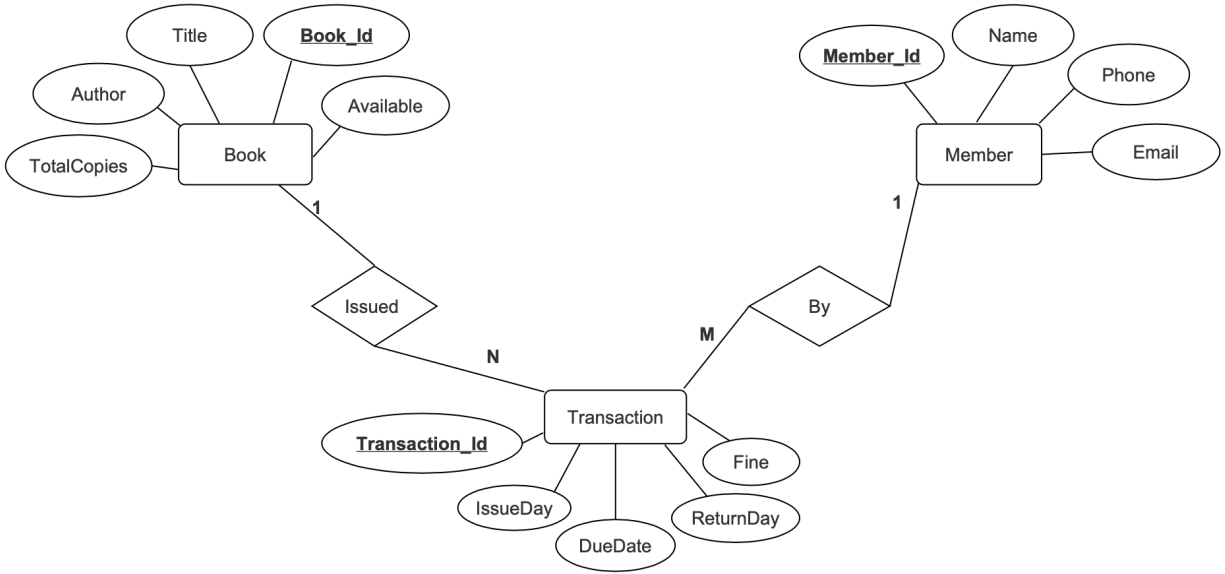
Hardware:

- Intel i3 (or higher) processor
- 2 GB RAM
- 200 MB disk space
- Standard keyboard and mouse

Software:

- Language: C
- Operating System: Windows / macOS / Linux
- Compiler: GCC / Turbo C / Code::Blocks

ER diagram of the proposed system



Data Structures & Concepts Used

- Structure (struct) – for Book, Member, and Transaction entities
- Array of Structures – to manage multiple records
- File Handling – for persistent data storage (binary files)
- Date Handling Algorithms – for due date calculation and fine computation
- Conditional Logic – for AI-based fine prediction
- Functions & Modular Programming – for reusability and clarity

Algorithm Explanation

Book Issue:

1. Input Book ID and Member ID
2. Record issue date
3. Auto-set due date = issue date + 14 days
4. Decrease available copies
5. Save transaction in file

Book Return:

1. Input Book ID and Member ID
2. Record return date
3. Calculate delay = (return date – due date)
4. Fine = delay × ₹2 (if late)
5. Mark transaction as returned

AI Prediction:

1. Fetch member's fine history
2. Calculate average fine
3. Predict if member is likely to return late

Time and Space Complexity

Time Complexity:

- Add/Search Book → O(n)
- Issue Book → O(1)
- Return Book → O(1)
- Fine Calculation → O(1)
- AI Prediction → O(n)

Space Complexity:

- Books Array → O(b)
- Members Array → O(m)
- Transactions Array → O(t)
- Total → O(b + m + t)

Where:

b = number of books, m = number of members, t = number of transactions

Front End

- Console-based, menu-driven system
- Provides easy text-based interaction for the user
- Displays clear options for all inventory operations
- Designed for simplicity, accuracy, and efficient use of DSA concepts

```
--- Library Fine Calculator ---
1. Add Book
2. View Books
3. Add Member
4. View Members
5. Issue Book
6. Return Book
7. View Transactions
8. Predict Late Return (AI Feature)
9. Exit
Enter choice:
```

Output

Fine Calculator

```
--- Library Fine Calculator ---
1. Add Book
2. View Books
3. Add Member
4. View Members
5. Issue Book (Auto 14-day Due Date)
6. Return Book
7. View Transactions
8. Predict Late Return (AI Feature)
9. Exit
Enter choice: 7

TID | BookID | MemberID | Issue | Due | Return | Fine
1 | 1 | 1 | 07/10/2025 | 21/10/2025 | 21/10/2025 | 0
2 | 2 | 1 | 12/09/2025 | 26/09/2025 | 30/09/2025 | 8
3 | 2 | 3 | 23/09/2025 | 07/10/2025 | 23/10/2025 | 32
4 | 1 | 3 | 15/09/2025 | 29/09/2025 | 30/09/2025 | 2
5 | 5 | 1 | 13/09/2025 | 27/09/2025 | 30/09/2025 | 6
```

Ai Predictor

```
--- Library Fine Calculator ---
1. Add Book
2. View Books
3. Add Member
4. View Members
5. Issue Book (Auto 14-day Due Date)
6. Return Book
7. View Transactions
8. Predict Late Return (AI Feature)
9. Exit
Enter choice: 8

--- Smart Fine Prediction ---
Enter Member ID: 3
Average Fine: 17.00
Prediction: LIKELY late return ⚠️

--- Library Fine Calculator ---
1. Add Book
2. View Books
3. Add Member
4. View Members
5. Issue Book (Auto 14-day Due Date)
6. Return Book
7. View Transactions
8. Predict Late Return (AI Feature)
9. Exit
Enter choice: 8

--- Smart Fine Prediction ---
Enter Member ID: 4
Member has no fine history. Prediction: On-time return ✅
```

Future Scope

- Integration with MySQL database for scalability
- Graphical User Interface (GUI) with Tkinter or web interface
- Auto email/SMS notification for due dates
- Integration with barcode scanning for book management

Conclusion

This project demonstrates practical use of C and basic DSA concepts to implement a Library Fine Calculator.
It covers real-world concerns — record-keeping, fine computation, persistence — while remaining a compact educational project that can be expanded with improved data structures and UI.

References

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