

Practice Assignment 5

Design Pattern

Lab Assignment: Applying Design Patterns in Library Management

Problem Description

You are tasked with developing a library management system with the following requirements:

1. **Document Management:** The library contains different types of documents such as books, magazines, and newspapers.
2. **Notification System:** Registered users should receive notifications when:
 - A new document is added.
 - A document they are interested in is borrowed or returned.
3. **Loan Fee Calculation:** The system should calculate the loan fee based on the type of document and the borrowing duration.
4. **Database Connection:** The system should ensure only a single connection to the database is used throughout.

Detailed Requirements

1. Use the **Singleton Pattern** to ensure the system has only one database connection instance.
2. Use the **Factory Method Pattern** to create document objects (Book, Magazine, Newspaper).
3. Use the **Observer Pattern** to notify users about changes in the library (new documents, document status changes).
4. Use the **Strategy Pattern** to calculate loan fees based on the document type and loan duration.

Database Design

The following tables are provided:

- **Documents Table:** Manages document information.
- **Users Table:** Manages user information.

- **Loans Table:** Manages loan and return information.

Submission Requirements

1. Submit the complete source code of the program.
2. Provide a report type *.pdf explaining how each design pattern is applied.