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Implementation of Virtual Library System using OOP C++

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Introduction

Design and Implementation of a virtual library system using the principles of Object-Oriented Programming (OOP). The system will allow users to manage a collection of books and perform operations like adding books, removing books, and searching for books by various criteria. I used C++ for System Implementation in this Assignment.

The Objective of this assignment is to Understand and apply OOP principles such as encapsulation, inheritance, and polymorphism, Practice designing classes and interfaces, And implement basic system operations using methods and properties.

Class Designs

I implemented two classes to complete my Library System.

1- Book Class: contains information about individual books.

Attributes	Description
‘title’	Title of The book
‘author’	Name of Book’s Author
‘isbn’	Unique Identifier of the book
‘puplicationYear’	Year the book was Published

Constructor:

- Book (): Default constructor that initializes ISBN and publication year to 0.

Methods:

- string getBookTitle(): Returns the title of the book.
- string getAuthorName(): Returns the author's name.
- int getBookId(): Returns the ISBN of the book.
- string getPublicationYear(): Returns the publication year of the book.
- void DisplayInfo(): Displays all information about the book.

2- Library Class: manages a collection of Book objects and provides methods to interact with them.

Attributes	Description
‘catalogue’	Collection of Books in the Library

Methods:

- void add_Book(Book book): Adds a new book to the library.
- void remove_Book(int isbn): Removes a book from the library by ISBN.
- vector<Book> find_books_by_author(string author): Returns a vector of books by the specified author.
- vector<Book> find_books_by_year(string publicationYear): Returns a vector of books published in the specified year.
- void Display_all_Books(): Displays all books in the library.

Implementation Notes

Data Structures:

- The main data structure used in the implementation is the vector from the C++ Standard Template Library (STL).
- The Library class utilizes a vector<Book> to store the collection of books in the library.
- Each Book object contains attributes such as title, author, ISBN, and publication year, which are stored as member variables.

User Guide

Running the Program:

- Ensure you have a C++ compiler installed on your system.
- Copy the provided code into separate .cpp files for Library and Book classes.
- Compile the program using your C++ compiler.
- Run the compiled executable.

Using Features:

- Upon running the program, you'll be presented with a text-based menu.
- Choose an option by entering the corresponding number:
    1. Add a new book.
    2. Remove a book.
    3. Search by author.
    4. Search by publication year.

5. Display all books.
6. Exit the program.

Conclusion

This assignment demonstrates the implementation of a virtual library system using Object-Oriented Programming (OOP) concepts. It covers the following key aspects:

- Class Design: The Book and Library classes are designed with appropriate attributes and methods, encapsulating data and behaviors.
- Encapsulation: Data hiding is achieved by making member variables private and providing public getter methods.
- Polymorphism: The DisplayInfo() method in the Book class showcases polymorphic behavior, allowing different book objects to display their information.

Overall, this assignment illustrates how OOP principles can be applied to model and implement real-world systems, providing modularity, reusability, and maintainability to the codebase.

References

- GPT.
- YouTube.