LIBRARY MANAGEMENT SYSTEM

A PROJECT

Submitted by

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In partial fulfilment for the award of the degree of

BACHELOR OF TECHNOLOGY

in

Computer Science & Engineering

Under the supervision of

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SHARDA SCHOOL OF ENGINEERING AND TECHNOLOGY

SHARDA UNIVERSITY, GREATER NOIDA – 201310

8th July, 2024

DECLARATION

I hereby declare that the lab report entitled "Library Management System" submitted to Sharda University, Greater Noida is a record of an original work done by me under the guidance of Dr. Renu Mishra and this research is being submitted to fulfil the requirements for the award of degree of Bachelor of Technology in Computer Science & Engineering.

Place: Greater Noida   Signature of the Student

Date: 8th July 2024

ACKNOWLEDGEMENT

A project is a golden opportunity for learning and self-development. We consider our self very lucky and honored to have so many wonderful people lead us through in completion of this project.

First and foremost we would like to thank Dr. Sanjeev Kumar Pippal, HOD, CSE who gave us an opportunity to undertake this project.

My grateful thanks to Dr. Renu Mishra for her guidance in my project work. Dr.Renu Mishra who in spite of being extraordinarily busy with academics, took time out to hear, guide and keep us on the correct path. We do not know where we would have been without his help.

CSE department monitored our progress and arranged all facilities to make life easier. We choose this moment to acknowledge their contribution gratefully.

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ABSTRACT

Online Library Management System is a system which maintains the information about the books present in the library, their authors, the members of library to whom books are issued, library staff and all. This is very difficult to organize manually. Maintenance of all this information manually is a very complex task. Owing to the advancement of technology, organization of an Online Library becomes much simple. The Online Library Management has been designed to computerize and automate the operations performed over the information about the members, book issues and returns and all other operations. This computerization of library helps in many instances of its maintenances. It reduces the workload of management as most of the manual work done is reduced

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INTRODUCTION

The Library Management System (LMS) implemented in this lab report serves as a practical demonstration of efficient book management techniques in a virtual library environment. This system is designed to handle fundamental operations such as adding new books, displaying existing ones, searching by title, and deleting by ID. These functionalities are encapsulated within classes that organize data using C++'s vector and string data structures.

The primary objective of this lab experiment is to explore the implementation of object-oriented principles in software development, particularly focusing on classes (Book and Library) and their interactions. The Book class represents individual books with attributes like ID, title, and author, while the Library class manages a collection of books using vector containers.

Throughout this report, we delve into the methodologies employed to achieve seamless book management. This includes the utilization of member functions within classes for data manipulation, such as adding, displaying, searching, and deleting books. The system's design ensures user-friendly interaction via a console-based interface, facilitating straightforward input and output operations.

Furthermore, the experiment highlights essential programming concepts such as encapsulation, abstraction, and inheritance, as exemplified in the organization and management of book data. Error handling mechanisms are integrated to provide robust feedback to users, ensuring data integrity and system reliability.

By exploring and analyzing this implementation, we aim to gain insights into practical software development practices, emphasizing the importance of structured design, efficient data handling, and user-centric interface design in real-world applications.

In the realm of modern library operations, effective management of book inventory is crucial for ensuring smooth and efficient services to patrons. The Library Management System (LMS) presented in this lab report embodies a foundational approach to achieving this goal through structured software design and implementation.

MOTIVATION

The motivation behind developing the Library Management System (LMS) explored in this lab report stems from the fundamental need to streamline and optimize the management of library resources. Libraries serve as vital hubs of knowledge and learning, catering to diverse communities with a wide array of informational and recreational materials. However, the traditional methods of manually cataloging and organizing books are increasingly inadequate in the face of growing collections and evolving user expectations.

The LMS aims to bridge this gap by leveraging modern software engineering principles to automate key library operations. By developing a digital platform that efficiently handles tasks such as adding, displaying, searching, and deleting books, we strive to enhance the overall efficiency and effectiveness of library management. This project not only seeks to simplify administrative tasks but also aims to empower librarians and administrators with tools that improve accessibility, organization, and user experience.

Moreover, the motivation behind this endeavor extends beyond mere technical innovation. It embodies a commitment to preserving the integrity and accessibility of knowledge, ensuring that libraries remain vibrant centers of education and community engagement in the digital age. By exploring and implementing the LMS, we embark on a journey to uphold the timeless mission of libraries: to inspire, inform, and empower individuals through access to information and resources.

In essence, the development of the LMS is driven by a dedication to innovation, efficiency, and the enduring value of libraries as pillars of learning and cultural enrichment in society.

PROJECT OVERVIEW

The Library Management System (LMS) project aims to revolutionize library operations through the development of a comprehensive software solution. Built on principles of object-oriented programming (OOP) using C++, the system offers a sophisticated platform for managing library resources efficiently. Key features include the ability to add, display, search, and delete books from the library catalog, all facilitated by a user-friendly console interface. The LMS prioritizes data integrity with robust mechanisms for storing and retrieving book information, ensuring accuracy in library records. Emphasizing scalability, the system is designed to accommodate future growth in library collections and operational needs. By automating routine tasks and enhancing user accessibility, the LMS aims to streamline administrative workflows and enhance the overall user experience for both librarians and patrons. Future enhancements may include database integration for persistent data storage and advanced search functionalities to cater to diverse user needs. Ultimately, the LMS project represents a significant step towards modernizing library services, leveraging technology to support libraries as vital centers of learning and community engagement.

CODING IN C++

Book and Library class to represent and manage the books in library

```cpp
#include <iostream>
#include <vector>
#include <string>
using namespace std;

class Book {
public:
    string title;
    string author;
    int id;

    Book(int id, string title, string author) {
        this->id = id;
        this->title = title;
        this->author = author;
    }
};

class Library {
private:
    vector<Book> books;
```

Functions to add,display,search and delete a book

```cpp
int main() {
    Library library;
    int choice;
    int id;
    string title, author;

    while (true) {
        cout << "\nLibrary Management System" << endl;
        cout << "1. Add Book" << endl;
        cout << "2. Display Books" << endl;
        cout << "3. Search Book" << endl;
        cout << "4. Delete Book" << endl;
        cout << "5. Exit" << endl;
        cout << "Enter your choice: ";
        cin >> choice;
        cin.ignore(); // To ignore the newline character left in the buffer

        switch (choice) {
            case 1:
                cout << "Enter Book ID: ";
                cin >> id;
                cin.ignore();
                cout << "Enter Book Title: ";
                getline(cin, title);
                cout << "Enter Book Author: ";
                getline(cin, author);
                library.addBook(id, title, author);
                break;
            case 2:
                library.displayBooks();
```

Main function

```cpp
void addBook(int id, string title, string author) {
    Book newBook(id, title, author);
    books.push_back(newBook);
    cout << "Book added successfully!" << endl;
}

void displayBooks() {
    if (books.empty()) {
        cout << "No books in the library." << endl;
    } else {
        for (const auto &book : books) {
            cout << "ID: " << book.id << ", Title: " << book.title << ", Author: " << book.author << endl;
        }
    }
}
void searchBook(string title) {
    for (const auto &book : books) {
        if (book.title == title) {
            cout << "Book found!" << endl;
            cout << "ID: " << book.id << ", Title: " << book.title << ", Author: " << book.author << endl;
            return;
        }
    }
    cout << "Book not found." << endl;
}

void deleteBook(int id) {
    for (auto it = books.begin(); it != books.end(); ++it) {
        if (it->id == id) {
            books.erase(it);
            cout << "Book deleted successfully!" << endl;
            return;
        }
    }
    cout << "Book not found." << endl;
```

LANGUAGE AND LIBRARIES USED

The Library Management System (LMS) project is implemented using C++, a versatile and powerful programming language known for its efficiency and control over system resources. C++ is an extension of the C programming language, incorporating object-oriented programming (OOP) features, which make it well-suited for creating complex applications. The use of C++ in this project allows for clear organization of code through classes and objects, enabling modular and maintainable software development.

The project extensively utilizes the C++ Standard Library, particularly the following components:

iostream: This library is included to handle input and output operations. It provides essential functionality for reading from standard input (cin) and writing to standard output (cout). In the LMS project, iostream is used for interactions with the user, such as displaying menus, capturing user input, and presenting results.

vector: The vector container from the Standard Template Library (STL) is used to store the collection of books in the library. Vectors are dynamic arrays that can automatically resize as elements are added or removed, providing flexibility in managing the book collection. The vector container supports efficient access and modification of elements, which is crucial for operations such as adding, displaying, searching, and deleting books.

string: The string class from the Standard Library is used to manage textual data, such as book titles and authors. It provides a range of functionalities for string manipulation, including construction, comparison, concatenation, and searching. The string class simplifies handling text in the LMS project, ensuring robust and readable code.

By leveraging these libraries, the project achieves a balance of performance, simplicity, and functionality. The use of C++ and its Standard Library components enables the development of an efficient and user-friendly Library Management System, capable of handling typical library operations effectively.

<u>CONCLUSION</u>

The Library Management System (LMS) project demonstrates the application of software engineering principles to enhance the efficiency and effectiveness of library operations. Through the implementation of a C++-based system, the project automates essential tasks such as adding, displaying, searching, and deleting books, thereby streamlining administrative workflows and reducing the likelihood of manual errors. The intuitive user interface ensures that both librarians and patrons can interact with the system seamlessly, promoting a positive user experience. The emphasis on data integrity and scalability highlights the system's ability to maintain accurate records and adapt to future growth and evolving requirements. Overall, the LMS project represents a significant advancement in library management, providing a modern solution that supports the library's mission of facilitating access to knowledge and fostering community engagement. Future enhancements, such as integrating a database for persistent storage and implementing advanced search functionalities, will further elevate the system's capabilities, ensuring it remains a valuable tool in the digital age.