資料結構第二次作業

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一．說明

圖書管理：使用 std::list 儲存圖書資料，每本書有書名、作者和唯一編號。可以新增、刪除、搜索圖書，並依編號排序列出。

借閱者管理：使用 std::forward_list 儲存借閱者資料，每位借閱者有姓名及借閱的書籍編號。可以新增、刪除、搜索借閱者，並列出所有借閱者及其借閱書籍。

主程式：包含測試資料，測試各項功能，展示如何添加、搜尋、刪除和列出圖書和借閱者資訊。

二．程式

```
#include <iostream>
#include <list>
#include <forward_list>
#include <vector>
#include <algorithm>
#include <regex>

using namespace std;

struct Book {
    string title;
    string author;
    string id;

    Book(const string& title, const string& author, const string& id) : title(title), author(author), id(id) {}
};

struct Borrower {
    string name;
    vector<string> borrowedBooks;

    Borrower(const string& name, const vector<string>& borrowedBooks) : name(name), borrowedBooks(borrowedBooks) {}
};
```

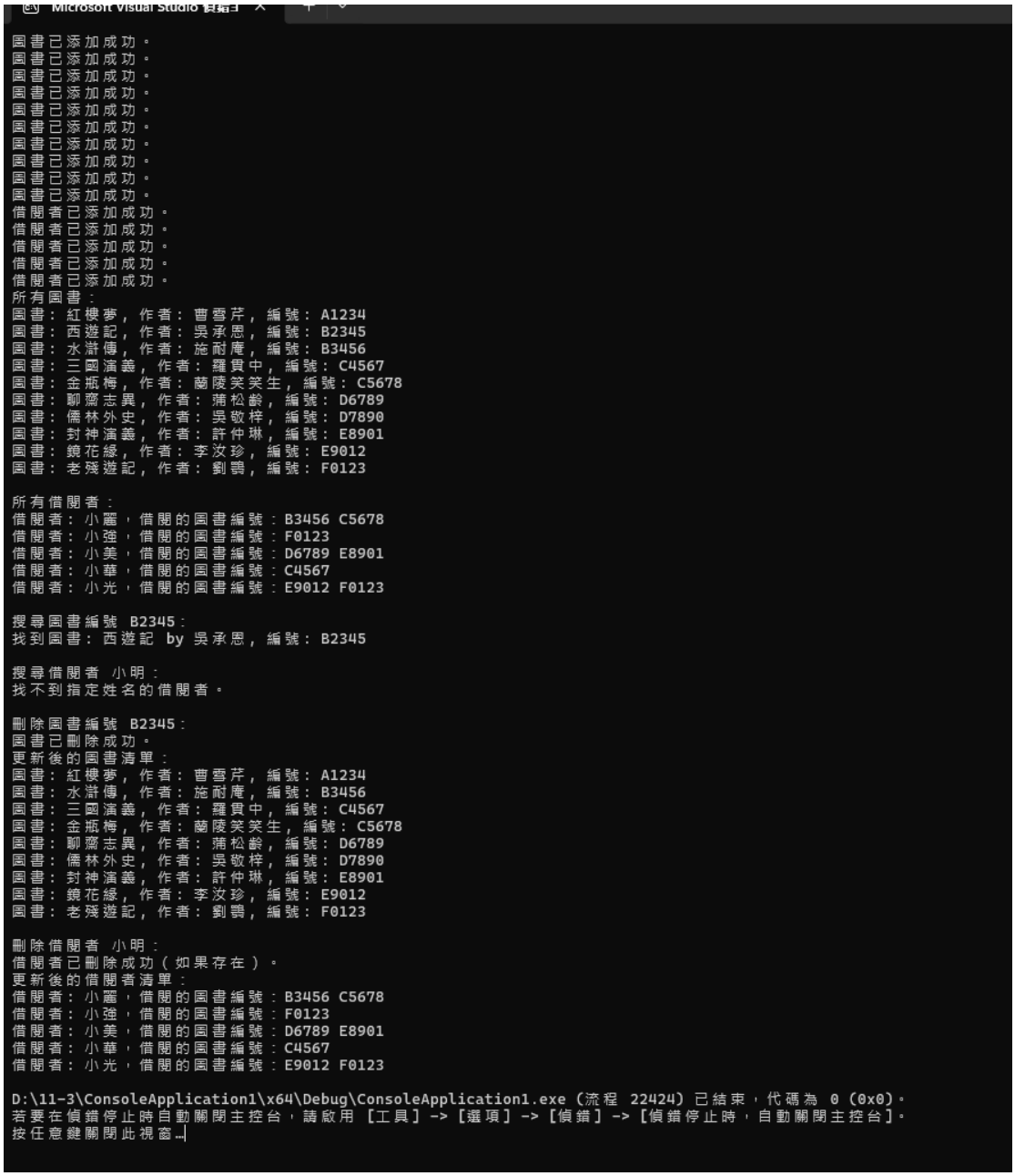
```
class LibrarySystem {
private:
    list<Book> books;
    forward_list<Borrower> borrowers;

public:
    // 添加圖書
    void addBook(const string& title, const string& author, const string& id) {
        if (!isValidBookID(id)) {
            cout << "圖書編號格式錯誤，請重新輸入。" << endl;
            return;
        }
        books.emplace_back(title, author, id);
        cout << "圖書已添加成功。" << endl;
    }

    // 刪除圖書
    void deleteBook(const string& id) {
        auto it = find_if(books.begin(), books.end(), [&](const Book& book) { return
book.id == id; });
        if (it != books.end()) {
            books.erase(it);
            cout << "圖書已刪除成功。" << endl;
        }
        else {
            cout << "找不到指定編號的圖書。" << endl;
        }
    }

    // 搜索圖書
    void searchBook(const string& id) {
        auto it = find_if(books.begin(), books.end(), [&](const Book& book) { return
book.id == id; });
        if (it != books.end()) {
            cout << "找到圖書: " << it->title << " by " << it->author << ", 編號: "
<< it->id << endl;
        }
```

```
        else {
            cout << "找不到指定編號的圖書。" << endl;
        }
    }

    // 列出所有圖書（依照編號排序）
    void listBooks() {
        books.sort([](const Book& a, const Book& b) { return a.id < b.id; });
        for (const auto& book : books) {
            cout << "圖書: " << book.title << ", 作者: " << book.author << ", 編號:
" << book.id << endl;
        }
    }

    // 添加借閱者
    void addBorrower(const string& name, const vector<string>& borrowedBooks) {
        borrowers.emplace_front(name, borrowedBooks);
        cout << "借閱者已添加成功。" << endl;
    }

    // 刪除借閱者
    void deleteBorrower(const string& name) {
        borrowers.remove_if([&](const Borrower& borrower) { return borrower.name ==
name; });
        cout << "借閱者已刪除成功（如果存在）。" << endl;
    }

    // 搜索借閱者
    void searchBorrower(const string& name) {
        auto it = find_if(borrowers.begin(), borrowers.end(), [&](const Borrower&
borrower) { return borrower.name == name; });
        if (it != borrowers.end()) {
            cout << "找到借閱者: " << it->name << "，借閱的圖書編號：";
            for (const auto& bookID : it->borrowedBooks) {
                cout << bookID << " ";
            }
            cout << endl;
        }
```

```
        else {
            cout << "找不到指定姓名的借閱者。" << endl;
        }
    }

    // 列出所有借閱者
    void listBorrowers() {
        for (const auto& borrower : borrowers) {
            cout << "借閱者: " << borrower.name << "，借閱的圖書編號：";
            for (const auto& bookID : borrower.borrowedBooks) {
                cout << bookID << " ";
            }
            cout << endl;
        }
    }

private:
    // 驗證圖書編號格式
    bool isValidBookID(const string& id) {
        regex pattern("^[A-Z][0-9]{4}$");
        return regex_match(id, pattern);
    }
};

int main() {
    LibrarySystem library;

    // 添加圖書資料
    library.addBook("紅樓夢", "曹雪芹", "A1234");
    library.addBook("西遊記", "吳承恩", "B2345");
    library.addBook("水滸傳", "施耐庵", "B3456");
    library.addBook("三國演義", "羅貫中", "C4567");
    library.addBook("金瓶梅", "蘭陵笑笑生", "C5678");
    library.addBook("聊齋志異", "蒲松齡", "D6789");
    library.addBook("儒林外史", "吳敬梓", "D7890");
    library.addBook("封神演義", "許仲琳", "E8901");
    library.addBook("鏡花緣", "李汝珍", "E9012");
    library.addBook("老殘遊記", "劉鶚", "F0123");
```

```
    // 添加借閱者資料
    library.addBorrower("小光", { "E9012", "F0123" });
    library.addBorrower("小華", { "C4567" });
    library.addBorrower("小美", { "D6789", "E8901" });
    library.addBorrower("小強", { "F0123" });
    library.addBorrower("小麗", { "B3456", "C5678" });

    // 測試功能
    cout << "所有圖書：" << endl;
    library.listBooks();
    cout << "\n所有借閱者：" << endl;
    library.listBorrowers();

    cout << "\n搜尋圖書編號 B2345：" << endl;
    library.searchBook("B2345");
    cout << "\n搜尋借閱者 小明：" << endl;
    library.searchBorrower("小明");

    cout << "\n刪除圖書編號 B2345：" << endl;
    library.deleteBook("B2345");
    cout << "更新後的圖書清單：" << endl;
    library.listBooks();

    cout << "\n刪除借閱者 小明：" << endl;
    library.deleteBorrower("小明");
    cout << "更新後的借閱者清單：" << endl;
    library.listBorrowers();

    return 0;
}
```

三・執行結果



https://github.com/4b2g0116/4B2G0116-.git