

## Design Document

### Library Manager

#### Description

This SQL programming project involves the creation of a database host application that interfaces with a backend SQL database implementing a Library Management System. Users of the system are understood to be librarians (not book borrowers).

#### Implement

This application is realized using Python, MySQLdb and Tkinter. In total, it has 4 .py files:

- \* **tableCreator.py**

The main function is creating these tables in the database:

BOOK

BOOK\_AUTHORS

AUTHORS

BORROWER

BOOK\_LOANS

FINES

Including all those foreign key constraints.

- \* **book\_authors.py**

The main functions include:

- \* open books.csv file, parse it and import corresponding data to the BOOK table
- \* open books.csv file, parse it and import corresponding data to the AUTHORS table
- \* open books.csv file, parse it and import corresponding data to the BOOK\_AUTHORS table

During manipulations above, some strategies are used:

- \* For AUTHORS table, a hashset is used to add an author to the table that has been added. Because each author id corresponds to a unique author.

\* For BOOK\_AUTHORS table, if a book has more than one author, we split these authors up and establish a one-to-many relationship between book and author. Of course, an author may write more than one book, which is another one-to-many relationship.

\* **borrower.py**

open borrowers.csv file, parse it and import corresponding data to the BORROWER table

\* **Interface.py**

This python file includes all of the functions and classes of the application, including:

\* `create_main_page()`

It generates the welcome and login page.

\* `check_run()`

It checks whether username and password match. If it does, go the function selection page. Else it keeps showing this page.

\* `function_selection ()`

It gives functions including “Book Manager”, “Borrower Manager” and “Fine Manager”.

\* `book_menu_window ()`

It goes to this page if you choose “Book Manager” in the function selection page. You can choose either “Search a book” or “Return a book”.

\* `borrower_menu_window ()`

It goes to this page if you choose “Borrower Manager” in the function selection page. You can choose “Add a borrower”.

\* `fine_menu_window ()`

It goes to this page if you choose “Fine Manager” in the function selection page. You can choose “Update fines”, “Show fines” or “Pay fines”.

\* `search_book ()` and `show_result()`

It goes to this page if you choose “Search a book” in the `book_menu_window()`. You are able to search for a book, given any combination of ISBN, title, and/or Authors. Substring matching is supported. When you click “Search”, it will show all the matching books and their information. What’s more, they are ordered by the relevance. That is to say, for example, if the

keyword you enter is a part of ISBN, title, and author of a book, this book record will be the first one in the result list.

- \* immediately1 ()

It goes to this page if you click “check\_out” in the show\_result().

You will fail to borrow the book if:

- \* The book has been borrowed and not returned yet

- \* You have borrowed 3 books and not returned them yet

- \* return\_book () and return\_function()

It goes to this page if you click “Return a book” in the book\_menu\_window ().

You may get warning message if there is no matching record in the database. If there are matching records, return\_function() will give the result list and you can choose one to return.

- \* immediately3 ()

It goes to this page if you click “return” in the return\_function(). It will set the return date of the record as today.

- \* add\_window ()

It goes to this page if you click “Add a borrower” in the borrower\_menu\_window().

You will fail to add a borrower if the borrower with its SSN has already had a library card.

- \* add\_function()

It will add a borrower to the borrower table with the information that is typed into the input fields.

- \* update\_function()

It goes to this page if you click “Update fines” in the fine\_menu\_window (). This function can update each fine amount in the FINES table.

- \* pay\_function() and search\_function()

It goes to this page if you click “Pay fines” in the fine\_menu\_window (). You can see the fines amount you have not paid yet. The search\_function() can show a borrower’s each book loan that has passed the due date. Of course, each result’s fine has not been paid yet. You can choose one to pay by clicking “Pay” button.

\* immediately2 ()

It goes to this page if you click “Pay” in the search\_function(). This function can update a fine record’s “Paid” attribute value in the FINES table.

You may fail to pay a record’s fine if you have not returned the book yet.

\* show\_function () and sum\_function ()

It goes to this page if you click “Show fines” in the fine\_menu\_window(). Each borrower can see their total fine amounts that have not been paid. You can pay them all by one click. You may fail if you don’t have any fines to be paid now.

\* immediately4 ()

It goes to this page if you click “Pay” in the sum\_function (). This function can update all fine records’ “Paid” attribute that are related to a borrower in the FINES table.

You may fail to pay all records’ fines if you have not returned all of the books.

## Relations

