

KEMI-TORNIO UNIVERSITY OF APPLIED SCIENCES

Design and Implementation of Assistant System for Online Library

Guan Chao

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PREFACE

I am honored to have worked with my project supervisor Mr. Thai Bui. There is no doubt he plays an important role to my project work in leading me into the right directions to success. I am deeply thankful for the contributions he has made and the dedication he has exemplified.

ABSTRACT

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The aim of this project was to design a website for assisting library. It is called online library assisting system. There are two parts components for users and administrators. Users can use the register system to register personally. The accounts of administrators should be added in the background database.

Users will be provided several functions such as browse the information of books, search the books, reserve the books and get the online support with the administrator etc. Administrators will be provided by system to manage the books, publish the notes and manage the reservations.

This website can be worked separately. The administrators are supposed to make books data of website synchronous with the local library. Users can make the reservations for the books that are available to lend in the local library. The reservations can only be canceled before administrators make them ready. After that, users can borrow these books with the reservations number in the local library. The administrators are supposed to update the quantity of these books, after the books are returned.

These languages were used in this project: PHP, JAVASCRIPT, and CSS. PHP is the main language for coding this website. JAVASCRIPT is used for building the dynamic functions of web pages. CSS is used for controlling the interface of website. MySQL is the database of this project.

Keywords: online, assisting, library, PHP, JAVASCRIPT, MySQL.

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EXPLANATION OF CHARCTERS AND ABBREVIATIONS

PHP:	Hypertext Preprocessor
HTML:	Hypertext Markup Language
CGI:	Common Gateway Interface
Perl:	A high-level, general-purpose, interpreted, dynamic programming language
JAVA:	A programming language
MySQL:	A database
JavaScript:	A script language
CSS:	Cascading Style Sheets
WYSIWYG:	What you see is what you get
Wamp:	A local host
ER	Entity-relationship
HTTP	Hypertext Transfer Protocol

1. INTRODUCTION

The aim of this project is to develop an online library system for a typical college library. The application can be accessed throughout the campus. This system can be used for searching the books, reserving the books, contacting with the administrators etc. This is one of integrated system that contains the user component and the administrator component. Therefore, the website will be divided into two parts: the user part and the administrator part.

User part:

- **Online Support System:** The online support system is designed for users to chat with administrators. Therefore, users can get support quickly.
- **Reservation System:** The users are allowed to reserve books online. Then the users will get the reservations numbers to take the books in the local library. The state of reservations is displayed in the reservation page. Users can go to the local library with the reservation number to borrow the book, after the state of reservations change to "ready".
- **Suggestion System:** This idea is inspired by my supervisor Mr. Thai Bui. Users can get interrelated books from the suggestion system when users browse details of a book.
- **Search System:** This system is designed for users to search books with the key words. The user can search with the names or authors of the books.
- **Anti- Intrusion System:** The Anti-Intrusion System will check at all times whether users have logged in. If users browse pages without logging in, it will be detected with the Anti-Intrusion System. Furthermore, users will be forced to turn to login page with the Anti-Intrusion System.
- **Register System:** This system is designed for users to register their accounts. After that, the users can log into the system.

Administrator part:

- **Browse Reservation Timetable:** This function is designed for administrators to check the timetable of the reservations.
- **Manage Reservation:** Administrators are allowed to change the state of reservations with this function.
- **Manage Books:** Administrators are allowed to add, edit and delete books.

- **Manage Notes:** Admin can publish and delete notes. The notes are displayed in login page.
- **Online Support System:** Also administrators can use the online support system to chat with the users.

2. BACKGROUND

2.1. Technology

This part describes the main technology methods during designing the project. There are some introductions for these technologies show below.

2.1.1. PHP

PHP is the English language abbreviation for Hypertext Preprocessor. PHP is an HTML embedded language. It is implemented in server side. PHP is mostly useful scripting language. It is suitable for design Web. It is one of free open source code. Therefore we can find many examples from internet./1/

PHP can run the compiled code, the compiler can make encrypt and optimize code to run and make the code run faster. The feature of PHP is very powerful. PHP supports all features of CGI and supports most of popular databases and operating systems. For database, it is supported with the MySQL, Microsoft SQL Server etc. /1/

PHP feature facilities the development program. The technology of PHP is easy to learn for users due to it is embedded into HTML. For this reason, PHP is very suitable for Web development. PHP is used for being the main coding language for this project.

2.1.2. MySQL

MySQL is the most famous database in the world. The features of MySQL include high reliability, high performance and ease of use. Many famous companies choose MySQL to use due to save time and money. MySQL is a small relational database management system. It is developed by Swedish company MySQL AB. Relational database stores data in separate tables, rather than stores all data in one big warehouse, so that MySQL can increase the speed and flexibility. MySQL is the most suitable database for this project. /2/

2.1.3. JavaScript

JavaScript is a script language in client-side. It is an object-based and event-driven and has the relative safety script language. JavaScript is used for adding dynamic functionality to HTML pages, such as in response to the various operations of user. Therefore, JavaScript is used for displaying dynamic table areas and control script for this project.

2.1.4. CSS

Cascading Style Sheets (CSS) is a simple mechanism for the adding style (e.g., fonts, colors, and spacing) to Web documents. It defines how to display HTML elements and control the appearance of Web pages. CSS can separate content and form style from pages, so that it can improve work efficiency. Styles are stored in style area, usually under the <head>. Also it can be stored in an external CSS file. Therefore we do not need to define style for each object. /3/

2.2. Software

2.2.1. Adobe Dreamweaver

Adobe Dreamweaver is the most famous software to design websites. The WYSIWYG (what you see is what you get) interface and supports HTML editing features are supported by Dreamweaver. Dreamweaver can be run with the Mac and WINDOWS system. /4/

Software Advantages:

- **Production efficiency:** Dreamweaver can be the fastest way to move Photoshop files into the pages. Using color selection tools, users can set the all the color they see. For the menu, the shortcut keys and the format control can be completed with one simple step. In addition, users can click picture, then Dreamweaver will open the Photoshop to edit and set the drawing optimization automatically.
- **Site Management:** Using the site map, the user can create the prototype web site, design and update pages quickly. Dreamweaver will update links automatically when the user changes the location of pages or file name. Using supports of text, HTML code, HTML tags attributes, Dreamweaver make complex site updates becomes fast and easy.

2.2.2. Adobe Photoshop

The newest version of Adobe Photoshop is CS5. Photoshop is one of the most famous software in Adobe Company. The Adobe Photoshop supports the 64-bit windows system. Photoshop is one of the most famous image processing software. The feature includes image scanning, editing picture, graphics product, image input and output etc. Photoshop is used for creating the picture for this project, for example, background, and navigation bar etc. /5/

2.2.3. Wamp

WampServer is a local host for this project. Wamp is a development environment which allows users to create the web application. Apache, PHP and MySQL are included in the WampServer. Users are allowed to use the function of PHPMysqlAdmin to manage the database. The install step is very easy, WampServer is installed automatically. Users can use the development environment without any setting. Apache, MySQL, and Perl/PHP/Python are used for building up a web application platform in this project. /6/

3. SYSTEM REQUIREMENT, ANALYSIS AND DESIGNING

3.1. System Requirement

For this project, the system requirement divides into two parts: the System hardware requirement and the Functional requirement. The hardware requirement is defined for the computer. The functional requirement is defined for users and administrators.

3.1.1. Hardware Requirement

The requirement of hardware includes in the processing power (CPU), memory (RAM), hard-disk, display adapter (graphics card) and peripherals (CD-ROM, keyboards, network devices etc.). This library assisting system is a web application. Therefore the requirement of hardware is very low. There is not special requirement for hardware. The most important part of the system is the network. That is the indispensable part in the whole system. Certainly, the keyboard and mouse is needed for user to input and operate.

3.1.2. Functional Requirement

Functional requirement defines the requirements which users (including administrators) have to meet. After that, they will be allowed to use the system. The requirements of users and administrators are different.

- **For administrators:**

Set up account: Due to the management function of this web site is not available for the public user, so that the accounts of administrators should be appended in the background database. The accounts of administrators are not allowed to set the duplicated name. The account name, password, telephone number and email should be filled into the account information. The length of the account name and password should be less than 10 characters. Telephone number is limited to 10 digits. Email has no limit for the length.

Manage reservation: Administrators require to log into the system. There is at least one available reservation waits for managing. Then administrators can change the state of reservation.

Browse reservation timetable: Administrators require to log into the system. There is at least one available reservation in reservation timetable.

Manage book: Administrators require to log into the system. There is at least one book in the database. After that, administrators can edit or delete the information of book.

Publish note: Administrators require to log into the system.

Online support: Administrators require to log into the system. There is at least one user waits for chatting.

- **For users:**

Register account: The registration system is provided for the public users to register their account. The account information must be filled in completely. The system will check automatically whether the user name is duplicated. The account name, password, telephone number and email should be filled into the account information. The length of account name and password should be less than 10 characters. The telephone number is limited to 10 digits. The email has no limit for the length.

Search book: Users require to log into the system. Require the users to input the key words.

Online support: Users require to log into the system. There is at least one administrator online.

Reserve book: Users require to log into the system.

- **For both of administrators and users:**

Log in: This system requires users to log in before they use the server of this web site. The Anti-Intrusion System will constantly check whether the users have logged in. If the users browse pages without logged in, it will be detected with the Anti-Intrusion System. Furthermore, the users will be forced to turn to the login page with the Anti-Intrusion System.

3.2. System Analysis

System analysis is used for analyzing what is required for system and design how to achieve it. The system analysis includes use case diagram, sequence diagram, ER and database diagram, site map of system and UI designing.

3.2.1. Use Case Diagrams

Use Case is one of the most important concepts in UML. Use Case is defined as: define and description system or functional unit of subsystem without showing the internal structure of the system or subsystem. For this project, the web site is designed for public library, so that the web site should be divided into the public users' part and the private administrators' part. Check the Use Case diagram below:

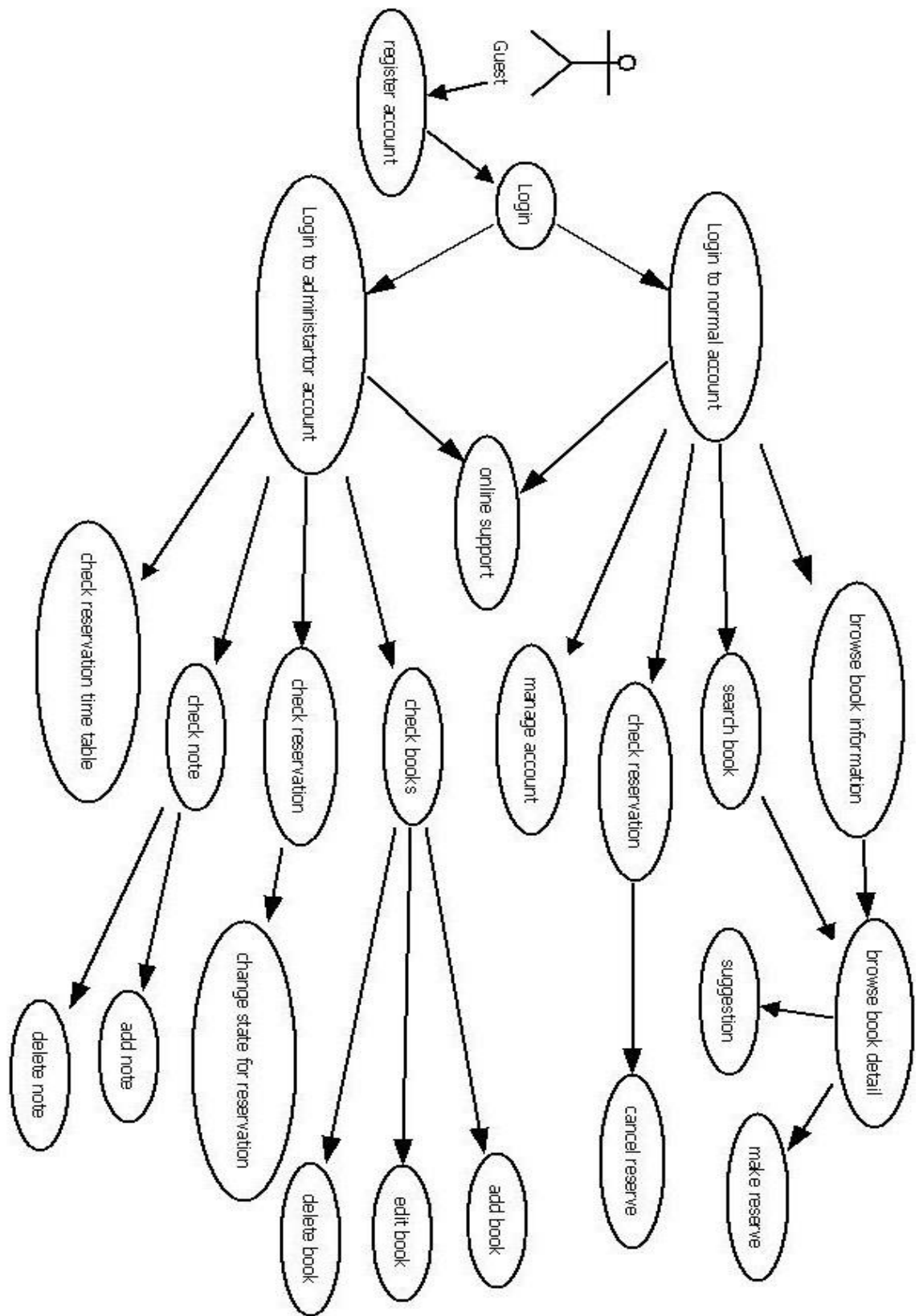


Fig. 1. Use Case Diagram

Based on this figure 1, after the guest logged in, the system is divided into user part and administrator part.

- User part: There are eight functions provided to users.
 - ✧ Browse Book Information: This part functions that the system display the basic information of book to the users. Each page will display five books. The users are allowed to browse all information of the books. The information of a book includes book name, author, ISBN book code, category, update time, book description and borrowing times.
 - ✧ Browse Book Detail: This part functions that the system displays the details of the books to the users. Users can browse the details of books. Furthermore, suggestions are provided with the suggestion system, when the users browsing the pages. Users can make a reservation for a book in viewing the page of detail of book.
 - ✧ Search Book: Users can input key words. Then, these key words will be searched in the database and display relevant result to the users. The key words include the name or authors or update date of books. Search function allows the users to search the books with the key words.
 - ✧ Suggestion: This part of function is to display the interrelated books which is chosen in the same category or borrowed by others.
 - ✧ Make Reservation: This function is designed for users to reserve books. The users can choose the reservation date when the users go to the local library to borrow the book within five days. The users are supposed to select the date when they go to the local library to borrow the books, before they send the information to the reservation system. After that, the reservation system will check the reservation whether it available or not. There are three cases in the result of check with the reservation control.
 - ✧ Check Reservation: This part is designed for users to check the state of reservations. The reservations have two kinds of state, "Ready" and "Wait". User can check the state of reservations. There are three kinds of state that are waiting, ready and finish. The reservations can be deleted by users when the state is "waiting".
 - ✧ Cancel Reservation: The reservations can be canceled by users before the state change to "Ready".
 - ✧ Online Support: This function is designed for users to contact with the administrators if the users want to inquire more information. The Administrators online list will be provided for the users to choose an administrator who is available. Therefore, the users can get support with the online chat.

- ◇ Manage account: This part is used for providing the service that is for users to change their information including the password.
- Administrator part: There are ten functions for administrators.
 - ◇ Browse Book: This part functions that administrators can browse all of book, each page display ten books.
 - ◇ Add Book: This part is designed for administrators to add a new book. Administrators must fill in all information about book.
 - ◇ Edit Book: This part is designed for administrators to edit a book. System will check book information whether complete.
 - ◇ Delete Book: This part is designed for administrators to delete a book from database.
 - ◇ Reservation list: This part is used for providing service that is for administrators to check the timetable of the reservations. It is displayed in the reservation list, when the state of reservations is “ready”.
 - ◇ Manage State of Reservations: This function is designed for administrators to change the state of reservations from “Waite” to “Ready”.
 - ◇ Publish Note: This part functions that administrators can browse all notes.
 - ◇ Add Note: This part functions that administrators can add new notes.
 - ◇ Delete Note: This part functions that administrators can delete notes.
 - ◇ Online Support: This function is designed for administrators change the state from offline to online.

3.2.2. Sequence Diagrams

Sequence diagram is one of the basic UML diagram. Sequence diagram is used for displaying dynamic collaboration between multiple objects based on described time sequencing of send messages between objects. Sequence diagram can represent behavior sequence of use case. /7/

Some sequence diagrams of the particular features are shown below: (the others are shown as appendix.)

3.2.2.1. Login Sequence Diagram

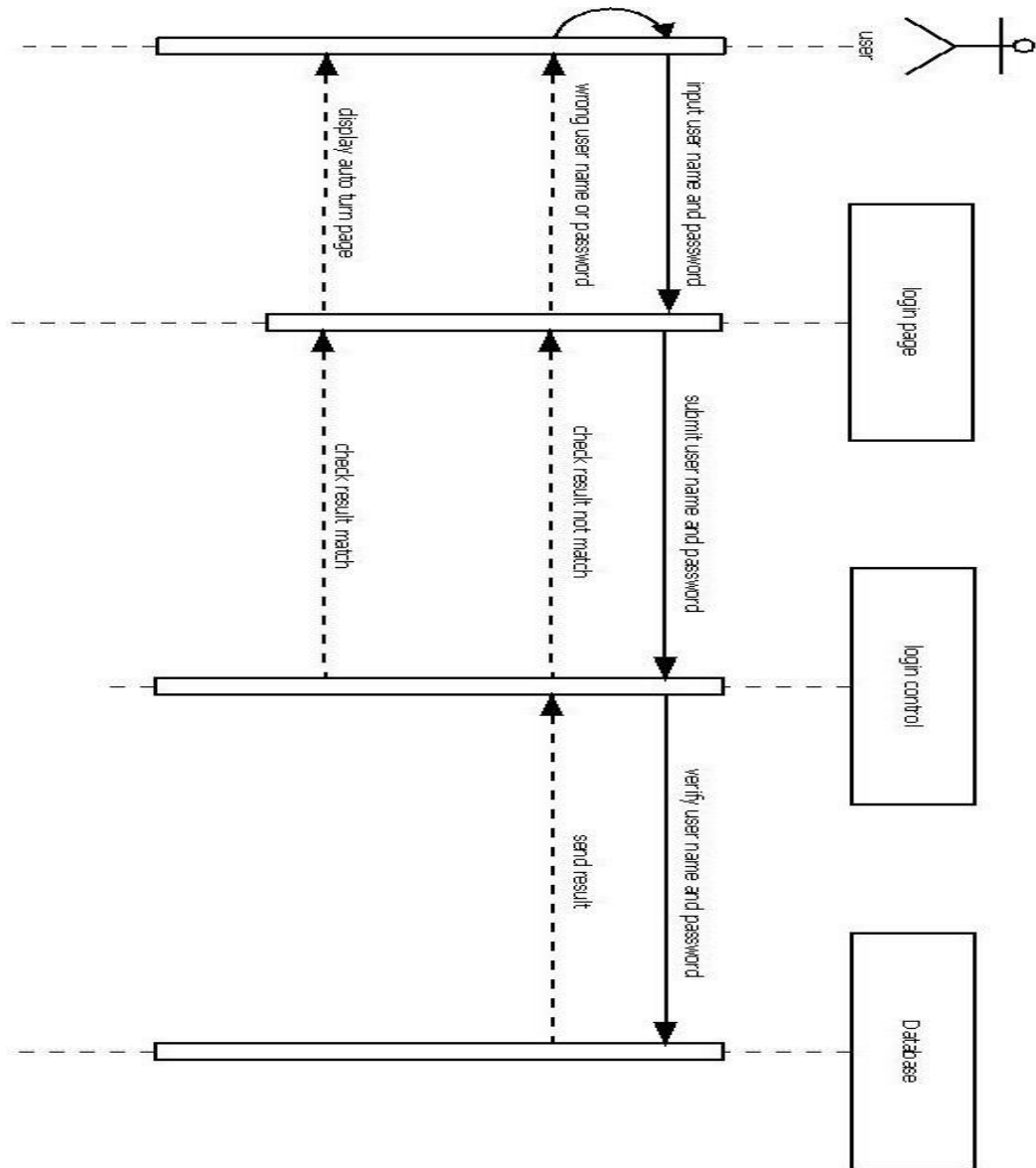


Fig. 2. Login Sequence Diagram

Figure 2 describes the use case of the user login to system. Users must fill in the user name and password in the login page. After users click the submit button, the user name and password will be verified with the login control in the database. The result will be checked with the login control based on the data which receives from the database. The result will be divided into two parts. One is the system will allow the users log in and turn to the users' page automatically if the user names and passwords are correct. Otherwise, the system will display warning information when users fill in the wrong user names or passwords. Then the system will turn back to the login page again.

3.2.2.2. Users Search Sequence Diagram

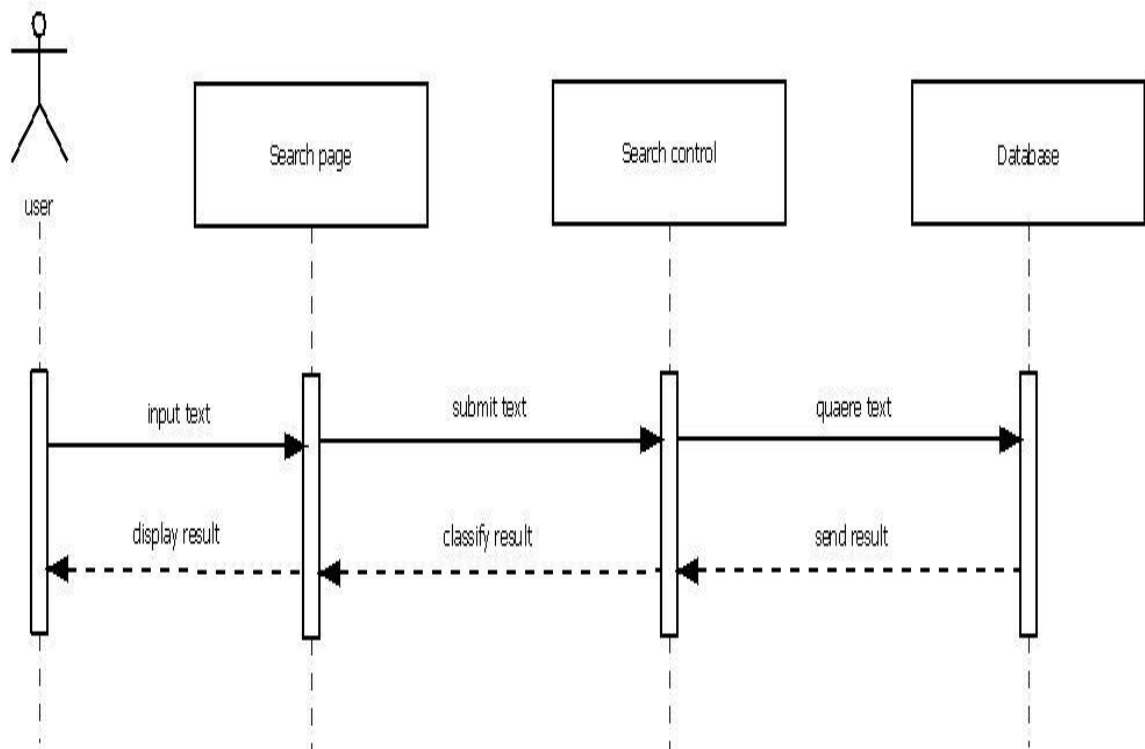


Fig. 3. Users Search Sequence Diagram

Figure 3 describes the sequence when users search the books. The search function allows users to search the books with the key words. The key words are included in the book name, authors, book category and the update time of books. Users are allowed to search the part of a word if users cannot spell the whole word. Therefore, the results are classified into two parts with the search control: exact part and inexact part.

3.2.2.3. Users Suggestion System Sequence Diagram

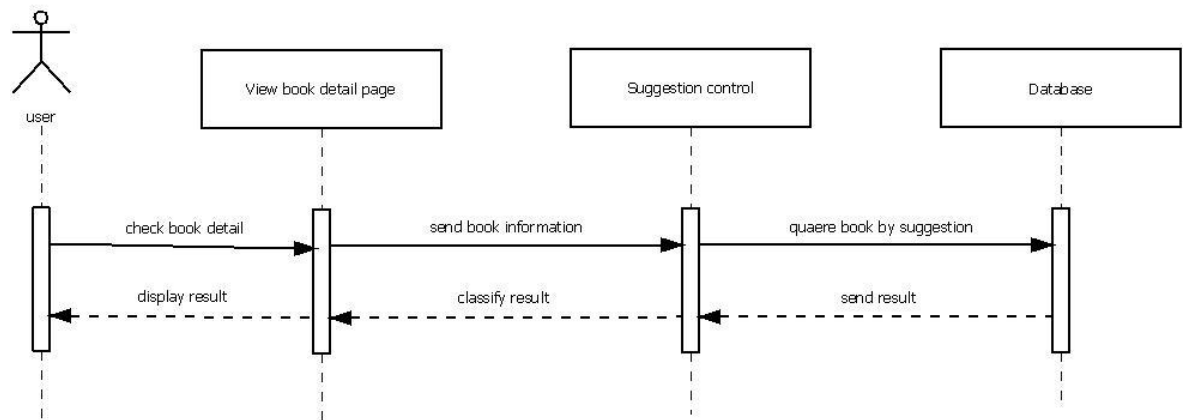


Fig. 4. Suggestion System Sequence Diagram

Figure 4 describes sequence about the suggestion system before users want to reserve a book. Users can make a reservation for a book in the page of detail of book. The suggestion system is used for displaying interrelated books to users when users browse a book detail. Therefore, suggestion system is to help users choose a suitable book before they make a reservation. There are two cases provided with the suggestion system to display the interrelated books.

3.2.2.4. Users Reserve Sequence Diagram

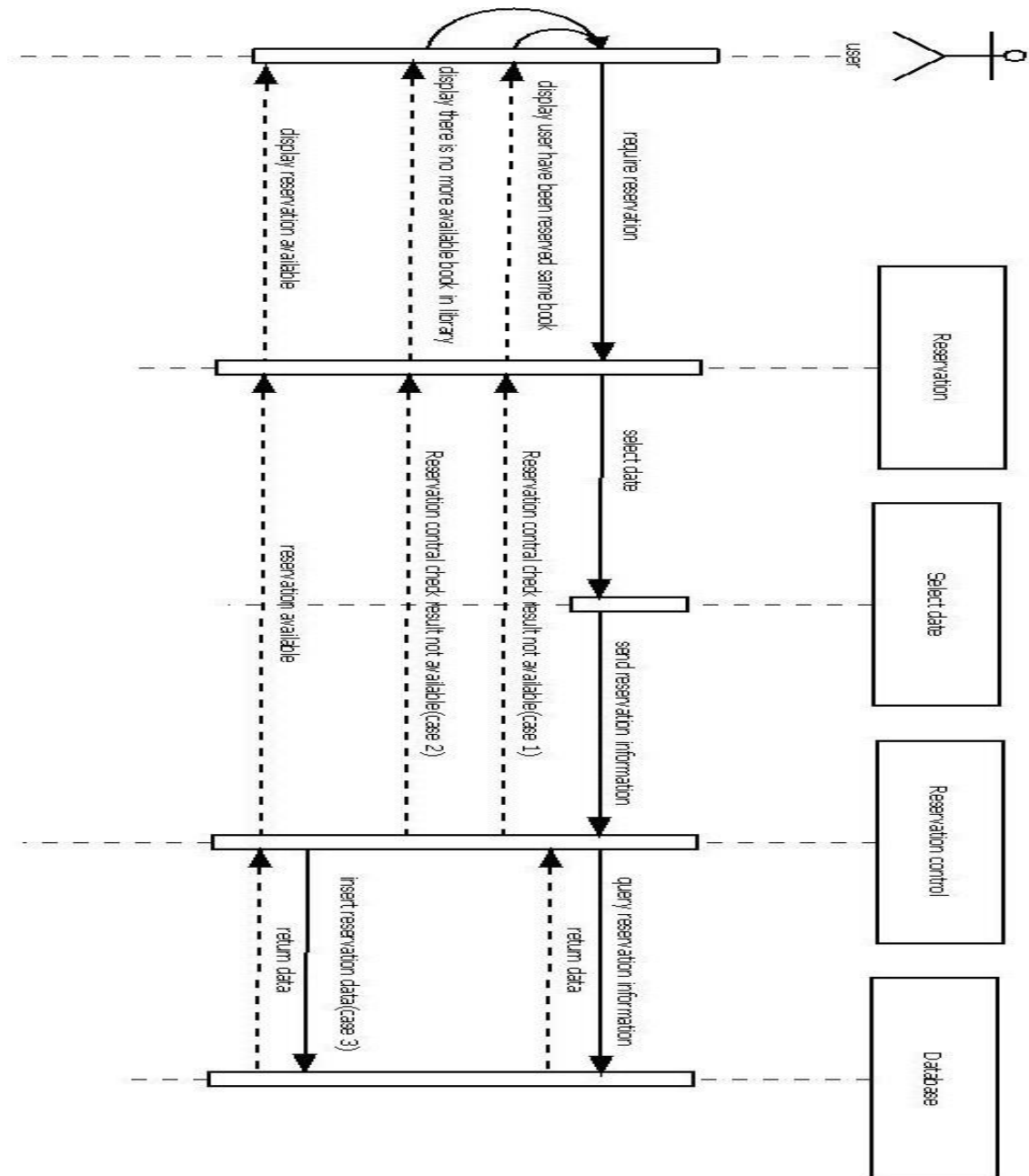


Fig. 5. Users Reserve Sequence Diagram

Figure 5 describes the sequence about users reserve a book. Users are supposed to select the date when they go to the local library to borrow the books before they send the information to the reservation system. After that, the reservation system will check the reservation whether it is available or not. There are three cases in the result of check with the reservation control.

3.2.2.5. Administrators Edit Image of Books Sequence Diagram

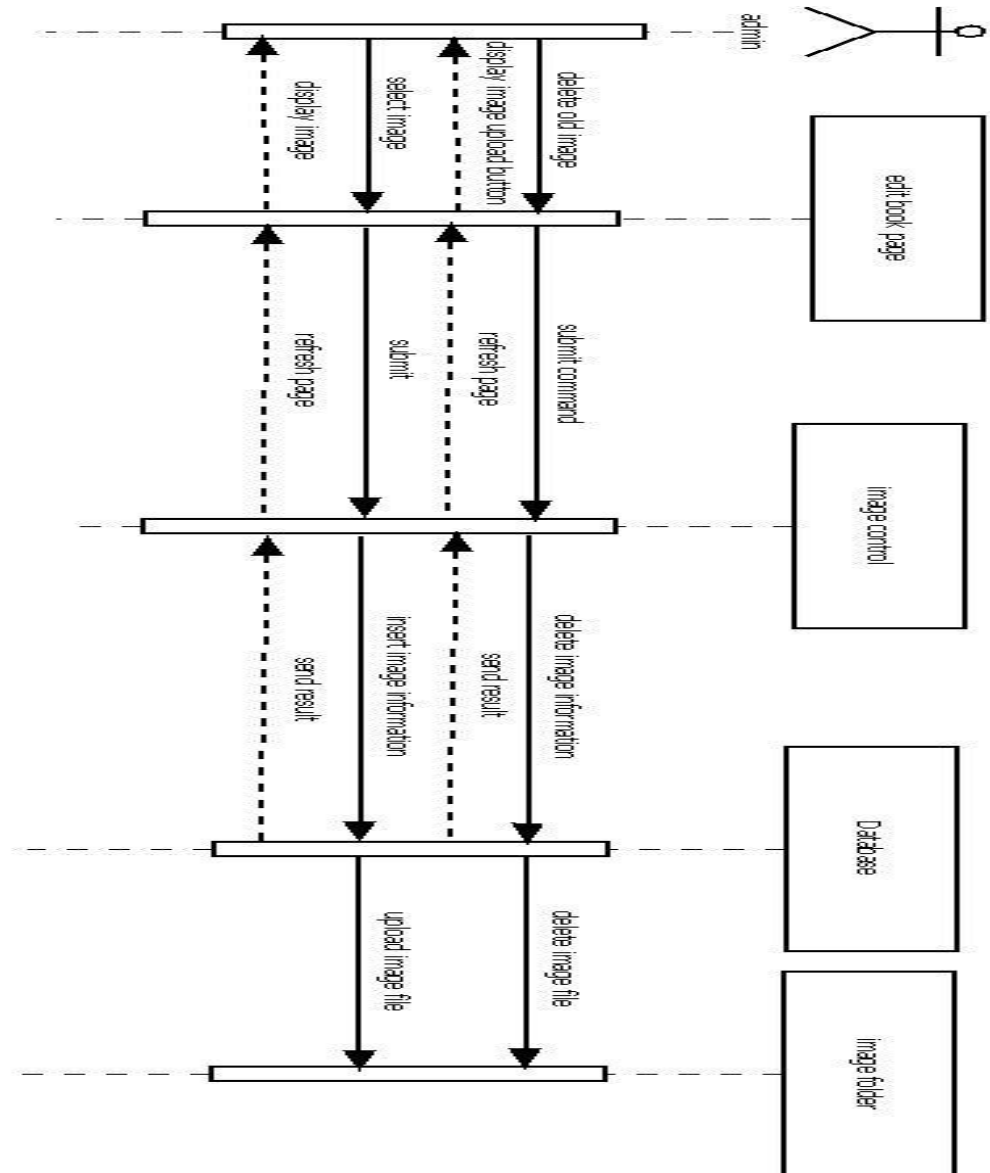


Fig. 6. Administrators Edit Image of Books Sequence Diagram

Figure 6 describes the sequence when administrators edit the image of books.

3.2.2.6. Online Support System

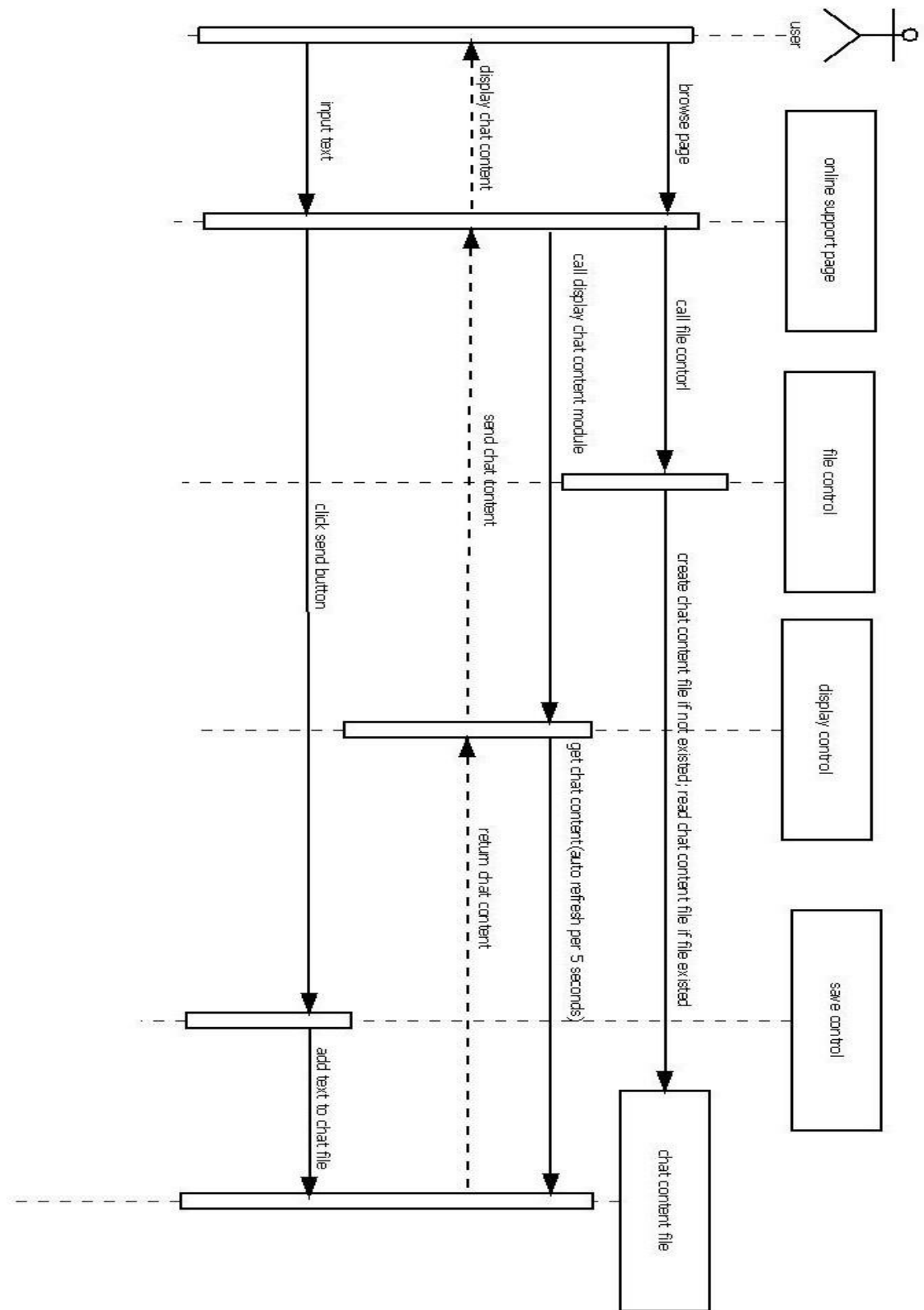


Fig. 7. Online Support Sequence Diagram

Figure 7 describes the sequence of the online support system. After users browse the online support page, the system will check whether the chat content files exist or not. The system will create file automatically if the file is not existed. Otherwise, the system will read the file if the file is existed. From this sequence diagram we got that the chat content will be displayed when users browse the online support page. Furthermore, display control will refresh the chat content per five seconds automatically, and then display the new chat content to users. When the texts are input by users, the system will add the new texts to the chat content file.

3.2.3. ER

ER (Entity-Relation) diagram is used for building up data model. ER diagram belongs to the phase of conceptual design during design database. The ER diagram is independent module of machine and DBMS (database management system). ER diagram provides the indicate methods of entity, attributes and relationship to describe concept modes of real world.

- Entity: It is represented by a rectangle.
- Attributes: It is represented by an oval. Multi-value attributes are connected by a double line. Underline is marked under the primary attribute.
- Relationship: It is represented by a rhombus.

/8/

The ER diagram is created based on part 3.2.1 use case diagram of system analysis. The entity and attributes is created to be suited for the system requirement. For example, there are user name, password, email, telephone number, last name and first name attributes in user account entity, due to users need log into the system with the user name and password, and the others basic information are used for administrators to contact with users.

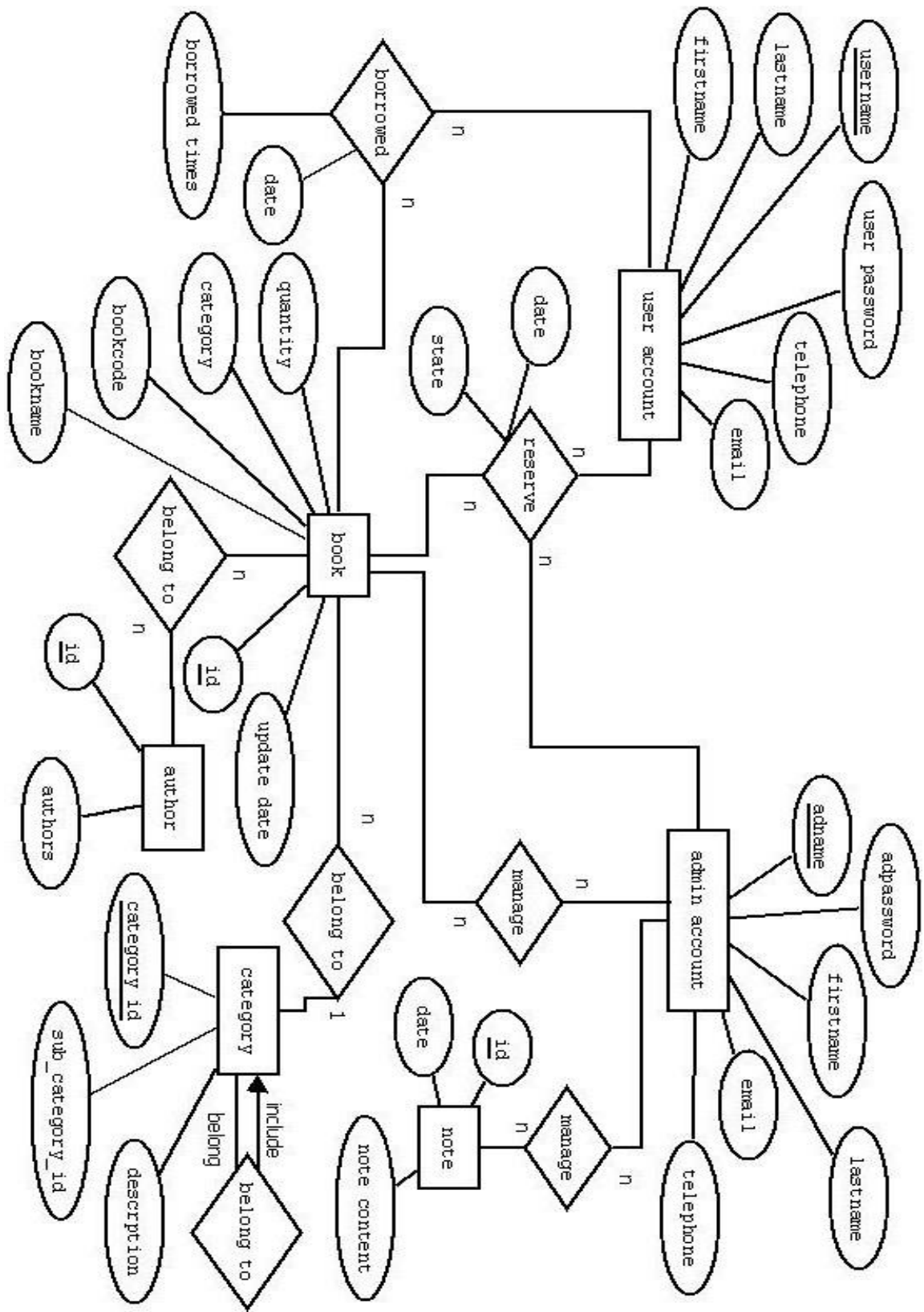


Fig. 8. ER Diagram

Figure 8 describes the relationships among entities, attributes and relationship. Based on this ER diagram we can get that there are seven entities in the database.

- Users account: This entity includes six attributes. The primary attribute is “username”. That means users cannot register the same username. This entity is used for users to log into the system.
- Admin account: This entity includes six attributes. The primary attribute is “adname”. That means administrators cannot register the same username. This entity is used for administrators to log into the system.
- Book: This entity includes six attributes. The primary attribute is “id”. This entity is designed to store the information of books.
- Author: This entity includes two attributes. The primary attribute is “id”. This entity belongs to the attribute of book. The entity is used for storing the authors of books.
- Category: This entity includes three attributes. The primary attribute is “category_id”. This entity belongs to the attribute of book. The category entity has self-relationship between “category_id” and “sub_category_id”. This entity is designed to store the information of categories.
- Note: This entity includes three attributes. The primary attribute is “id”. The entity is used for storing the information of notes.

Relationship

- Reserve: One user can reserve multiple books, and one book can be reserved by multiple users: “user account” (N) “reserve” “book” (N). One administrator can manage multiple reservations of books, and one reservation of book can be managed by multiple administrators: “admin account” (N) “manage reserve” “book” (N)
- Borrowed: One user can borrow multiple books, and one book can be borrowed by multiple users: “user account” (N) “borrowed” “book” (N)
- Manage(between admin account and book): One administrator can manage multiple books, and one book can be managed by multiple administrators: “admin account” (N) “manage” “book” (N)
- Manage (between admin account and note): One administrator can manage multiple notes, and one note can be managed by multiple administrators: “admin account” (N) “manage” “note” (N)
- Belong to(between book and author): One book has multiple authors, and one author belong to multiple books: “book” (N) “belong to” “author” (N)
- Belong to(between book and category): One book has multiple categories, and one category belong to multiple books: “book” (N) “belong to” “category” (N)

- **Belong to (self-relationship with the category):** There is a self-relationship in category. Categories belong to other categories.

Based on the ER diagram, we can draw the database diagram below:

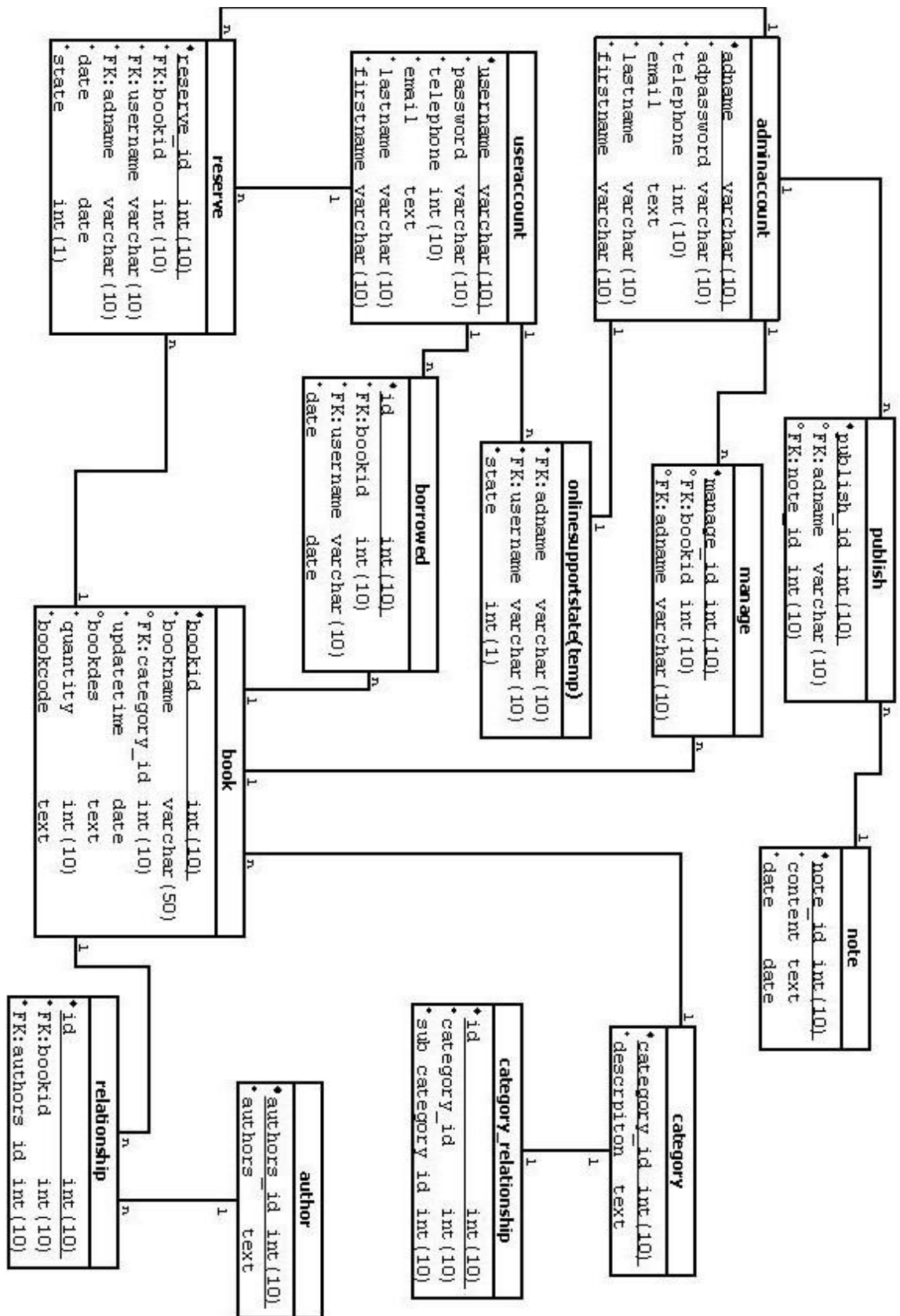


Fig. 9. Database Diagram

We can get relationships among all tables based on figure 9. Descriptions for database table are given as follows:

Transferring from relationship:

One “adminaccount” can publish multiple “publish” (1: n)

One “note” can be published by multiple “publish” (1: n)

One “adminaccount” can manage multiple “manage” (1: n)

One “book” can be managed by multiple “manage” (1: n)

One “adminaccount” can manage multiple “reserve” (1: n)

One “useraccount” can borrow multiple “borrowed” (1: n)

One “book” can be borrowed by multiple “borrowed” (1: n)

One “useraccount” can reserve multiple “reserve” (1: n)

One “book” can be reserved by multiple “reserve” (1: n)

One “book” has multiple “relationship” (1: n)

One “author” belongs to multiple “relationship” (1: n)

One “category” has multiple “book” (1: n)

One “category” belongs to one “category_relationship” (1: 1)

- Admin account table: The primary key is “adname”. “adname” and “adpassword” is used for logging into the system by administrator. Telephone number, email, last name and first name are basic information of users.
- User account table: The primary key is “username”. “username” and “password” is used for logging into the system by user. Telephone number, email, last name and first name are basic information of users.
- Publish table: The primary key is “publish_id”. It is designed for system to search data conveniently from database. The one of foreign key is “adname”. It is designed for system to make sure only administrators can add or delete notes. Another foreign key is “note_id”. It is designed for connect the table between publish and note.
- Note table: The primary key is “id”. The primary key is conveniently for system to select the data from database.
- Online support state table (temp): The primary key is “id”. The data are searched conveniently by system with the primary key. The foreign key is “adname” and “username”. State is designed to display the state of administrators. There are three kinds of state: offline, online and busy.

- Borrowed table: The primary key is "id". The primary key is helpful for system to search data conveniently from database. The foreign key is "bookid" and "username". "bookid" is used for getting the information of book.
- Reserve table: The primary key is "id". The foreign key is "bookid", "username" and "adname". "Bookid" is used for getting the information of book. "Adname" is designed for system to make sure only administrators can manage the reservation.
- Manage table: The primary key is "manage_id". The one of foreign key is "adname". It is designed for system to make sure only administrators can add or delete notes. Another foreign key is "bookid". It is designed for connect the table between manage and book.
- Book table: The primary key is "bookid". The foreign key is "category_id" and "adname". "Category_id" is used for getting category. "Adname" is designed for system that only administrators have the authority to manage books.
- Relationship table: The primary key is "id". The foreign key is "bookid" and "authors_id". "Bookid" is used for being joined into the information of books. "Authors_id" is used for getting authors name.
- Author table: The primary key is "authors_id". The primary key' feature is making the value different with each others. Therefore, the primary key is helpful for system search data conveniently from database.
- Category table: The primary key is "category_id". "Description" is described the name of category.
- Category_relationship table: The primary key is "id". It is designed for system to search data conveniently from database. "category_id" is designed to connect with the "sub_category_id". Therefore, we can get the whole category.

3.2.4. System Information Flow (Side Map)

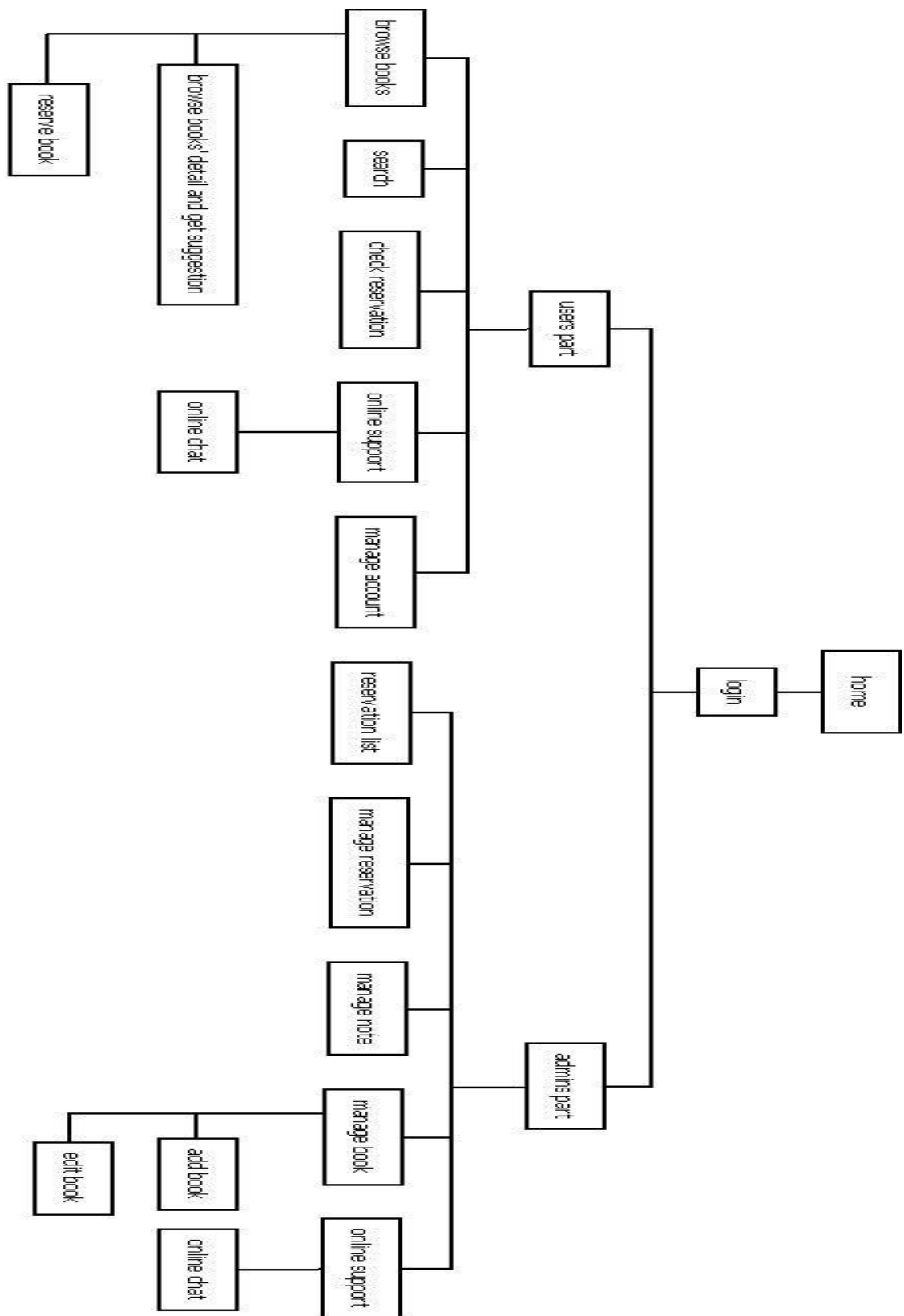


Fig. 10. Site Map

Figure 10 shows that the system is divided into two parts: users' part and administrators' part. In users' part, there are five pages to provide services that browse the books, search the books, check the reservations, manage the accounts and get the online support. The suggestion and the reservation system are provided when users browse the books. In administrators' part, there are five pages to provide services that check the reservations list, manage the reservations, manage the notes, online support, and manage books.

3.2.5. UI Design

This site is designed for library, so that the main style is supposed to be clear and concise. The pictures are designed with the Adobe Photoshop. The interface of main page, users' part page and administrators' page interface show below:



Fig. 11. Main Page Interface

Users can input the user name and password in the login page, after users click the picture which located in the center of figure 11. There is a small logo in top right-hand corner in each page. There is some salutatory (welcoming statement) under the center picture.



Fig. 12. Interface of Users' Part

There is a navigation bar in users' part. Users can turn to the other pages with the navigation bar. The picture of the background is maple leaf which made with the photo shop. Under the navigation bar, there is a state area which displays the name of users and logout button. Under the navigation bar, there is the area which displays main information. For example, figure 12, there is a books list in the area under the navigation bar. Users can browse five books in this page. Users can use the page navigation bar which in the end of list to turn page.



Fig. 13. Interface of Administrators' Part

There is a select menu in administrators' part as in figure 13. It is used for administrators to turn to the other pages.

4. IMPLEMENTATION

4.1. System Architecture

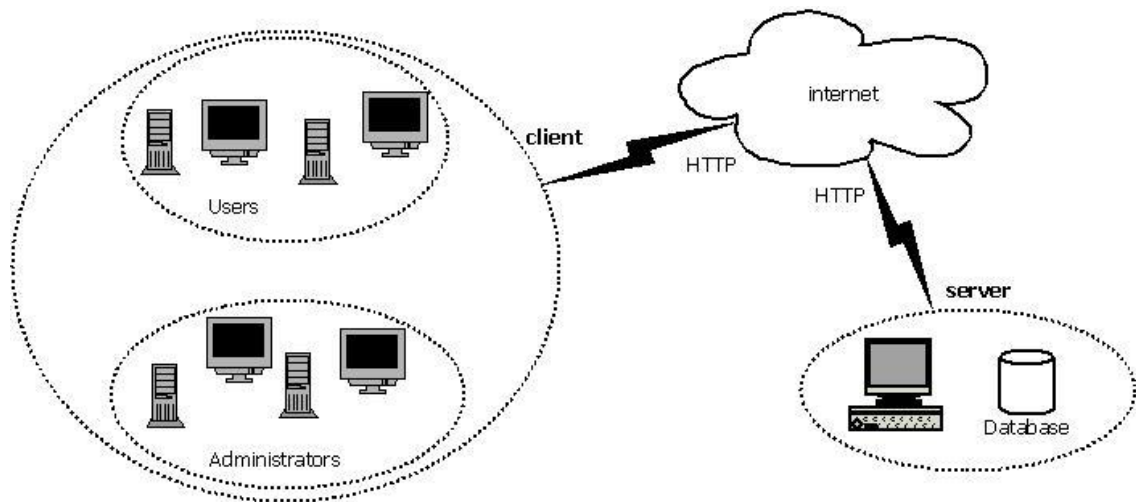


Fig. 14. Architecture of System

The architecture of online library assisting system is shown in figure 14.

HTTP is used for being the transport protocol between client and server. The HTTP is the English language abbreviation for Hypertext Transfer Protocol. The HTTP (Hypertext Transfer Protocol) transport protocol is used for users (including administrators) to browse website. Administrators are allowed to upload the image of books with the HTTP protocol. There is a database in server. The database is located in local server for this project. The remote database is supported by server, too.

4.2. Implementation of Some Particular Features

- **Anti-Intrusion Feature**

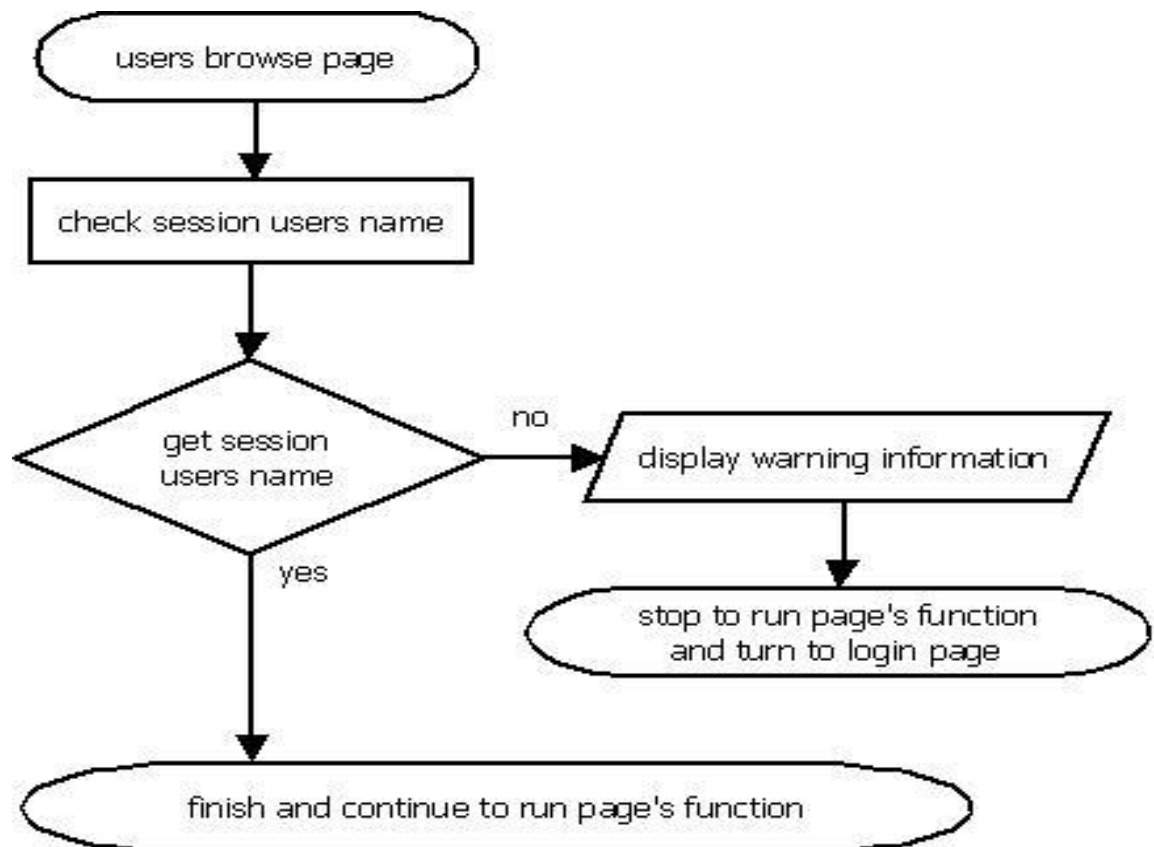


Fig. 15. Flowchart of Anti-Intrusion Feature

The anti-intrusion system is designed to prohibit users browsing pages without logging in. All pages are monitored with the anti-intrusion system anytime. Therefore, the users cannot get any information without logging in. The users will be turned to login page automatically, after anti-intrusion system finds the users who have not logged in. When users browse any page without logging in, they will get warning information, shown as figure 16.

You have not login. Auto turning waite 3 seconds



Fig. 16. Anti-Intrusion System

● Searching Feature

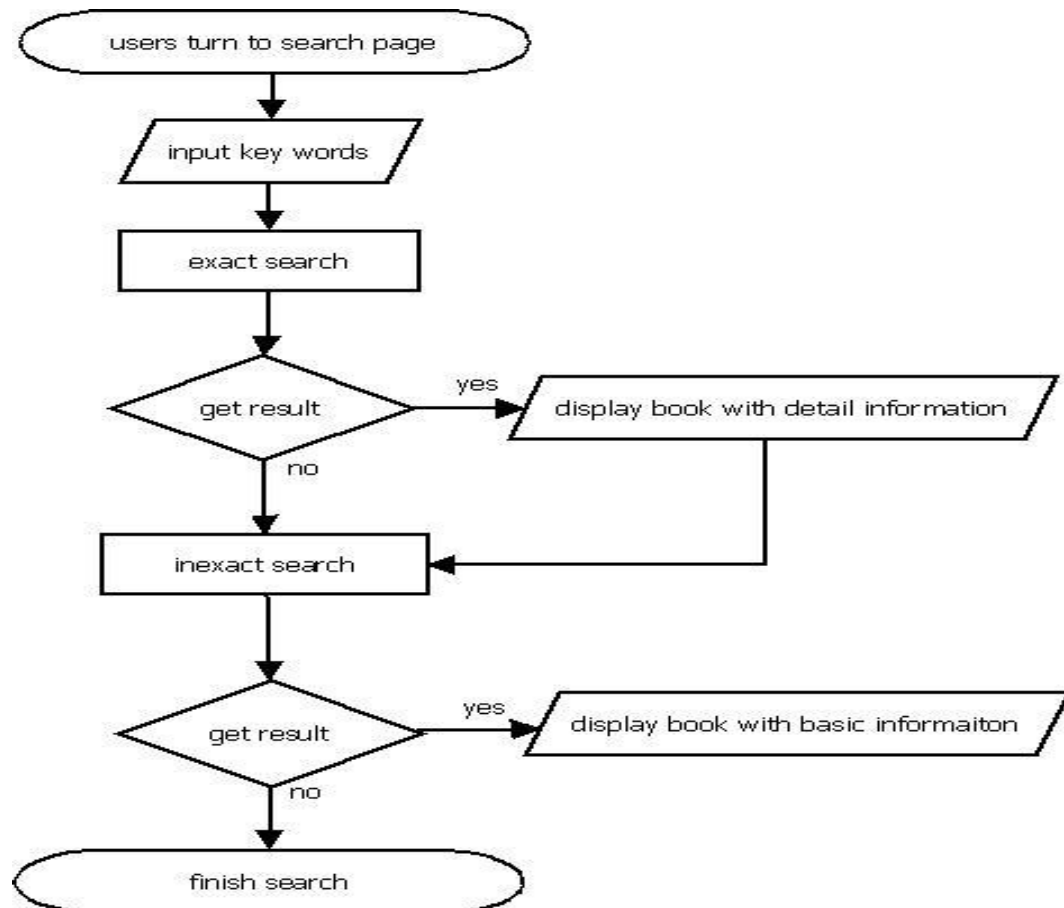


Fig. 17. Flowchart of Search Feature

Figure 3 describes the sequence about search books. The search function allows users to search books with the key words. The key words are included in book name, authors, book category and the update time of books. Users are allowed to search the part of a word if users cannot be able to spell the whole word correctly. Therefore, the results are classified into two parts: the exact part and the inexact part.

In explanation of exact part of search result is that display books which book information contents are as same as the search key words. That means it requires users to remember the book name or authors properly. For example, users are supposed to input the full name or author of book for searching, afterwards, this book will be displayed by system in exact part of search result.

In explanation of inexact part of search result is that the display books of the key words are included in the book information contents. That means users just need to remember the

part of the information of book such as a few words or a few letters of the word that they intended to search for.

Figure 17 describes as the flowchart of search system. Users turn to the search page, and input the key words. The system will search two times. In the first time (exact search), the system finds out the books which the key words have to be matched with the whole books name or authors name. The book will be displayed in the area which displays the details of book if the system finds any match book. In the second times (inexact search), the system finds out the books which the key words are matched with the part of book name or author name. Then, the book will be displayed in the area which displays the basic information of book if the system finds any match book.

Concrete example: Users input key words and click “search” button, shown in figure 18. Figure 19 displays that if users input the whole name of the book. Figure 20 displays that if users input the part of the book's name.

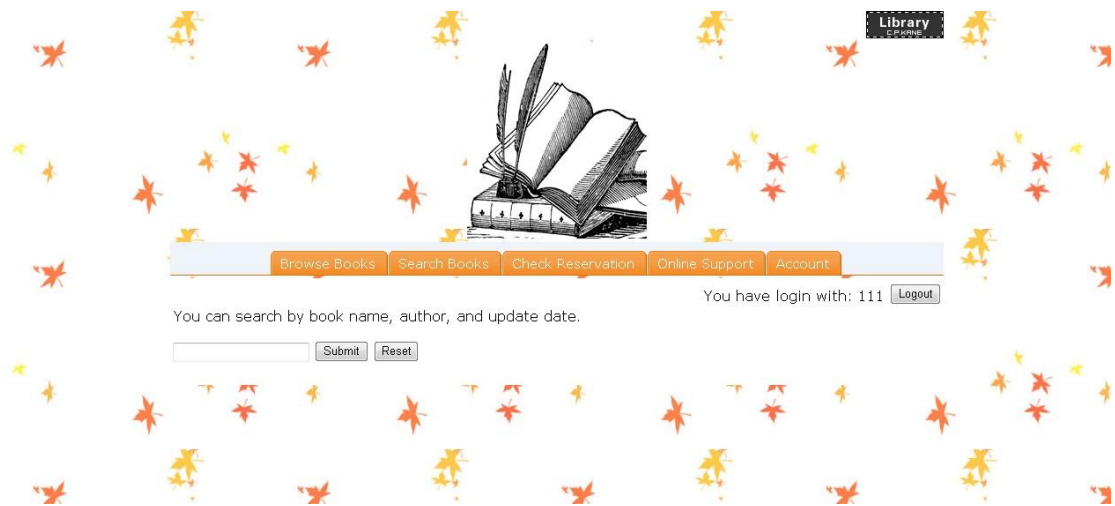


Fig. 18. Input Key Words

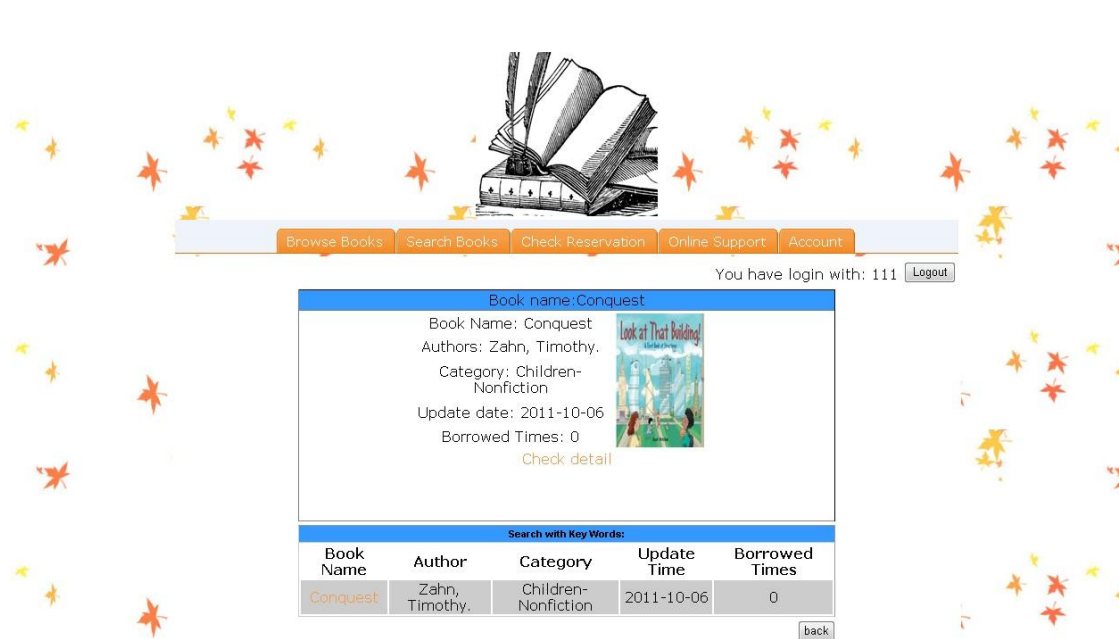


Fig. 19. Searching With Whole Name



Fig. 20. Searching With the Part of Book Name

● Suggestion Feature

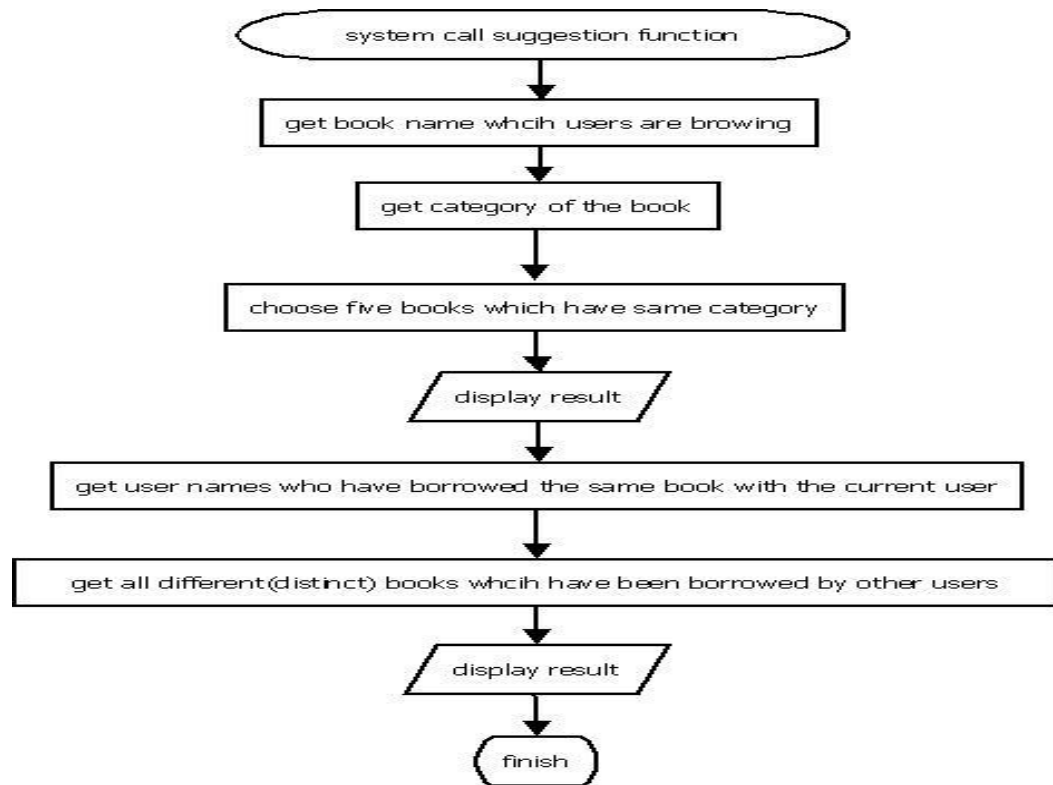


Fig. 21. Flowchart of Suggestion Feature

Figure 4 describes the sequence about suggestion system. Users can make a reservation for a book in viewing the page of detail of book. The suggestion system is used for displaying the interrelated books to users when the users browse the book detail. Therefore, the suggestion system is to help users choose a suitable book before they make a reservation. There are two cases provided with the suggestion system to display interrelated books.

Case one: The interrelated books will be chosen in the same category of the book that users are browsing. Furthermore, the suggestion system just displays five books.

Case two: The suggestion system will display the books which had been borrowed by others. This is more difficult to choose interrelated books. Firstly, suggestion system will get a user name list which users had been borrowed book which the same as the book of users are browsing. Secondly, the suggestion system will get all books name which had been borrowed based on user name list, and moreover, system will select books without duplicate. Finally, suggestion system will display the result to users.

Figure 21 describes the flowchart of suggestion system. Suggestion system starts to work when users browse the details of a book. Then the system gets the book name and category. In case one, the system finds out five books which have the same category. In case two, the system gets users which have borrowed this book before in the local library, and get their name. After having done it, the system gets all different (distinct) books which have been borrowed by other users. And then, the result will be displayed to users.

Concrete example: User (named “111”) has borrowed books “13 gifts 1st ed.” and “Meta 4”, as shown in figure 22. User (named “222”) will get suggestion in figure 23, when user browse a book named “13 gifts 1st ed.”.

Book Name	Date	Reservation ID	state	Operation
Meta 4	2011-10-27	7	Finish	
13 gifts 1st ed.	2011-10-29	8	Finish	

Fig. 22. The Reservation of User “111”

Book Name	Author	Book Code	Category	Update Time	Borrowed Times	Location	Store
13 gifts 1st ed.	Ritchie, Scot.	9780545310031	Adult-Nonfiction	2011-10-06	1	A1a	8

Book Discse: Shortly before her thirteenth birthday, shy and withdr awn Tara is sent to stay with her aunt, uncle, and cousin in her par ents hometown of Willow Falls, where she makes friends and beco mes involved with an elderly buyer and seller of collectibles, who s eems to be trying to give Tara some kind of mysterious message.

Interrelated books from same category:				
Book Name	Author	Category	Update Time	Borrowed Times
Meta 4	McKeever, Ted.	Adult-Nonfiction	2011-10-06	1
13 gifts 1st ed.	Ritchie, Scot.	Adult-Nonfiction	2011-10-06	1

See what other users borrowed:				
Book Name	Author	Category	Update Time	Borrowed Times
Meta 4	McKeever, Ted.	-	2011-10-06	0

Fig. 23. The Suggestion for User “222”

● **Reservation Feature**

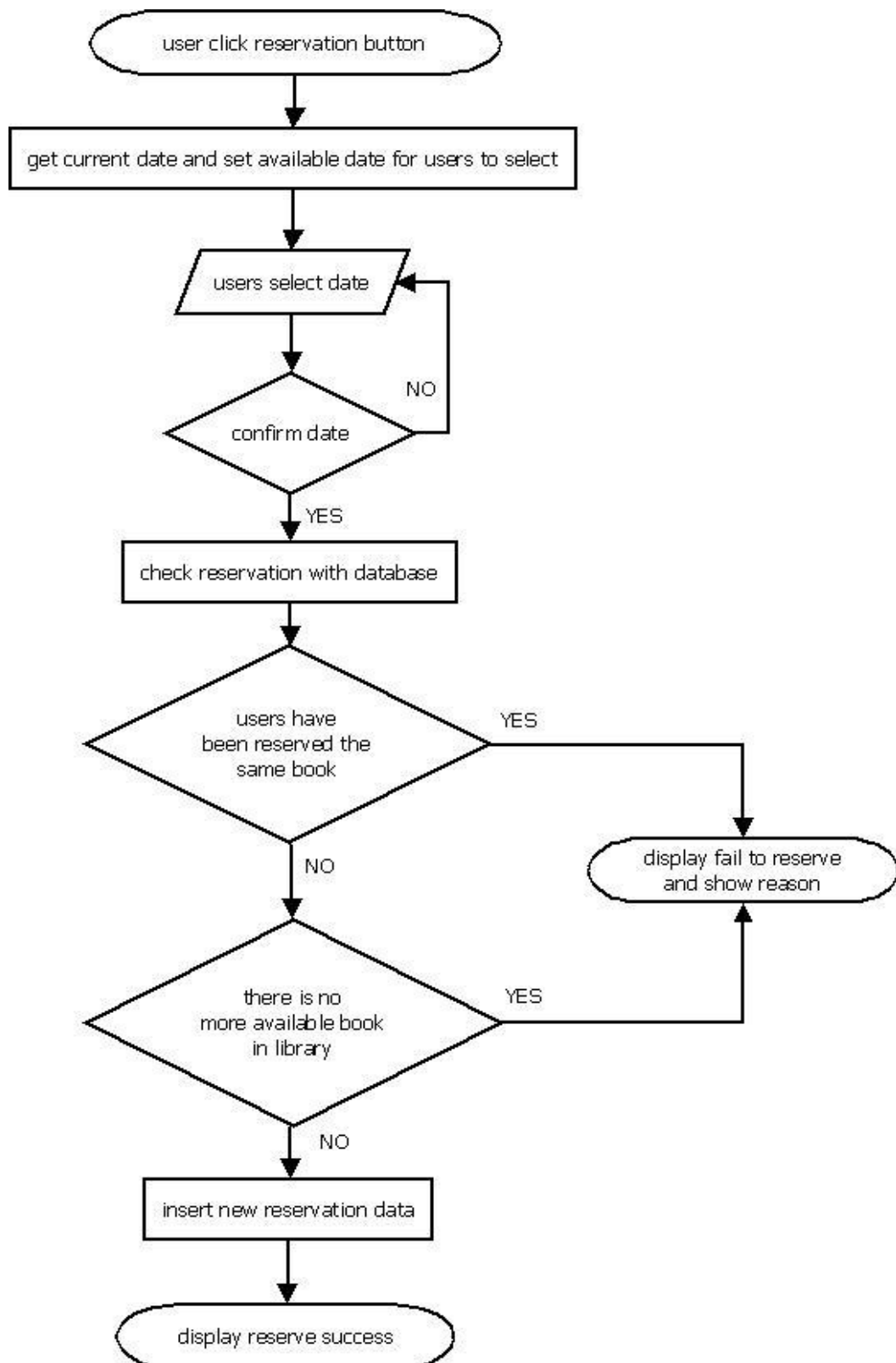


Fig. 24. Flowchart of User Reserve Book Feature

Figure 5 describes the sequence about reserving book. Users should select date when they go to the local library to borrow the books, before they send the information to the

reservation system. After that, the reservation system will check the reservation whether it available or not. There are three cases in the result of check with the reservation control.

Case one (fail): The reservation system checks database to confirm whether users have reserved the same book, the state of book is "waiting". System is not allowed to add duplicate reservation which has not finished. In this case, the result will be displayed by system that users cannot borrow books due to they have reserved the same book, furthermore, the reservation have not finished.

Case two (fail): The reservation system checks database to confirm whether the book is available or not. System checks the quantity in stock automatically. In this case, the result will be displayed by system that users cannot borrow books due to there is no more quantity of the book in the local library.

Case three (success): In this case, users are allowed to borrow books due to there is no case one and two occurred during reservation control check result.

Figure 24 describes the flowchart of user reserve book. Users can click the reservation button when users browse the details of books. System will get the current date, and the setting is available for users to select date when user can make a reservation. The system will check the reservation whether is available or not, after the reservation date is confirmed by users. A fail warning will be displayed by system if the reservation is not available. Otherwise, a new reservation will be inserted to database.

Concrete example: Users has to select the date when they go to the local library to borrow the books, shown in figure 25, after users click "reservation" button. Users will be allowed to send the information of reservation, after users confirm date. After that, the reservation system will check the reservation whether it available or not, shown in figure 26.



Fig. 25. Selecting Date



Fig. 26. The Result of Reservation Case Two

● Online Support Feature

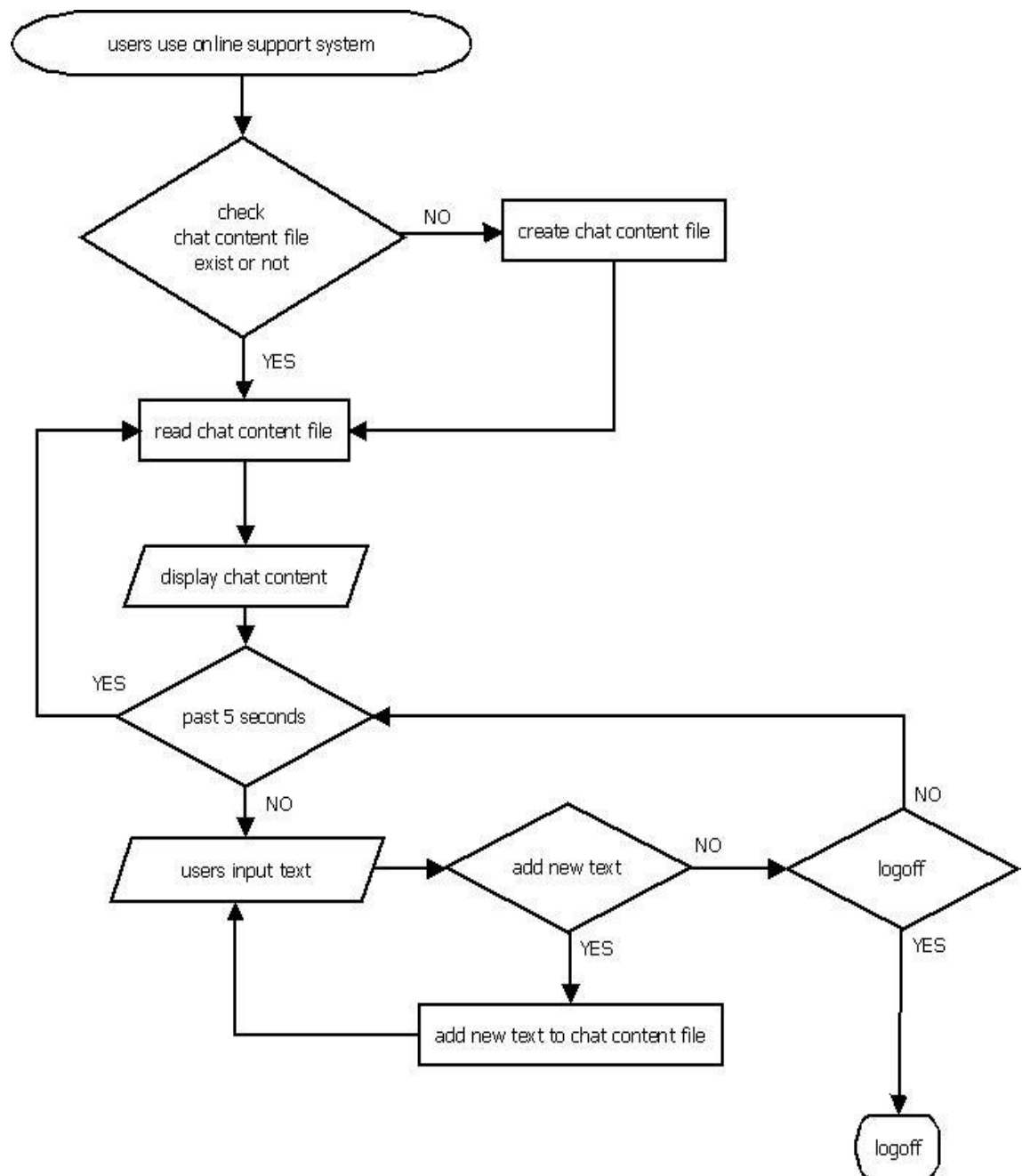


Fig. 27. Flowchart of Online Support Feature

Figure 7 describes the sequence of online support system. After users browse online support page, system will check whether the chat content file exist or not. The chat file is named with the user name and date. For example, today is 2011.10.28, user “111” use online support to chat with the administrator. Therefore, the chat file is named “111_2011-10-28.txt”. System will create file automatically if the file does not exist. Otherwise, the system will read the file if the file exists. From this sequence diagram it shows that the chat content will be displayed when the users browse online support page. Furthermore, the display control will refresh chat content in every five seconds automatically, then display new chat content to users. System will add new texts to the chat content file, when texts are inputted by users.

The online support system features the text editor and the lock position of scrollbar. Online support system will create a chat content file with the user name and date. Then save the file in the folder of server. The system only read the chat content file which is made on that day. Users can use text editor to set text style such as font color, align, font size, bold and italic etc when users chat with the administrators. The scrollbar always position to the end of table when the length of chat content exceeds the length of table.

Figure 27 describes the flowchart of online support system. The system will check whether the chat content file exists or not, after users start to use online system. The chat file will be created by system if the chat content file is not found. System will get the content of chat file, before displaying the content to users. Furthermore, the content will be read by system in every five seconds, users can input text simultaneously. The text will be added into the content file, when users send the text to system. System will return to check whether users input text or not if users do not click the logoff button. After that, system will check whether the time is over five seconds or not. The system works under the loop mode, shown in figure 27.

Concrete example: Users select an online administrator from list, shown in figure 28, before enter online support system. The system displays the administrator name, when users start to chat, shown in figure 29. Users use text editor to fill in text, before users click “send” button. Users are allowed to log out with the “exit” button in anytime.

The online support system is modified from open-source chatting room. All modules have modified to be suitable for this online library assisting system. For example: saving module, initializing module, display module and saying module.

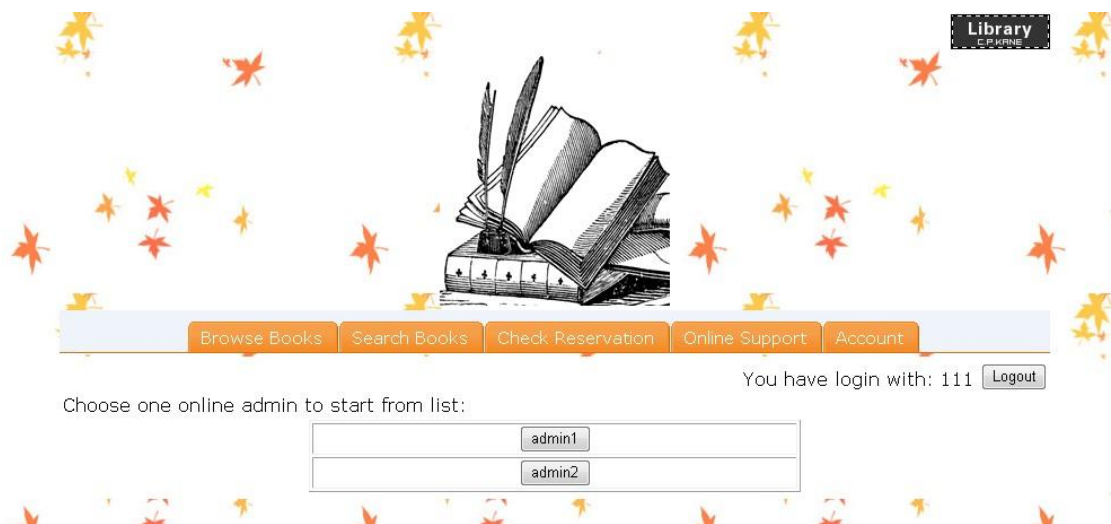


Fig. 28. Selecting Administrator

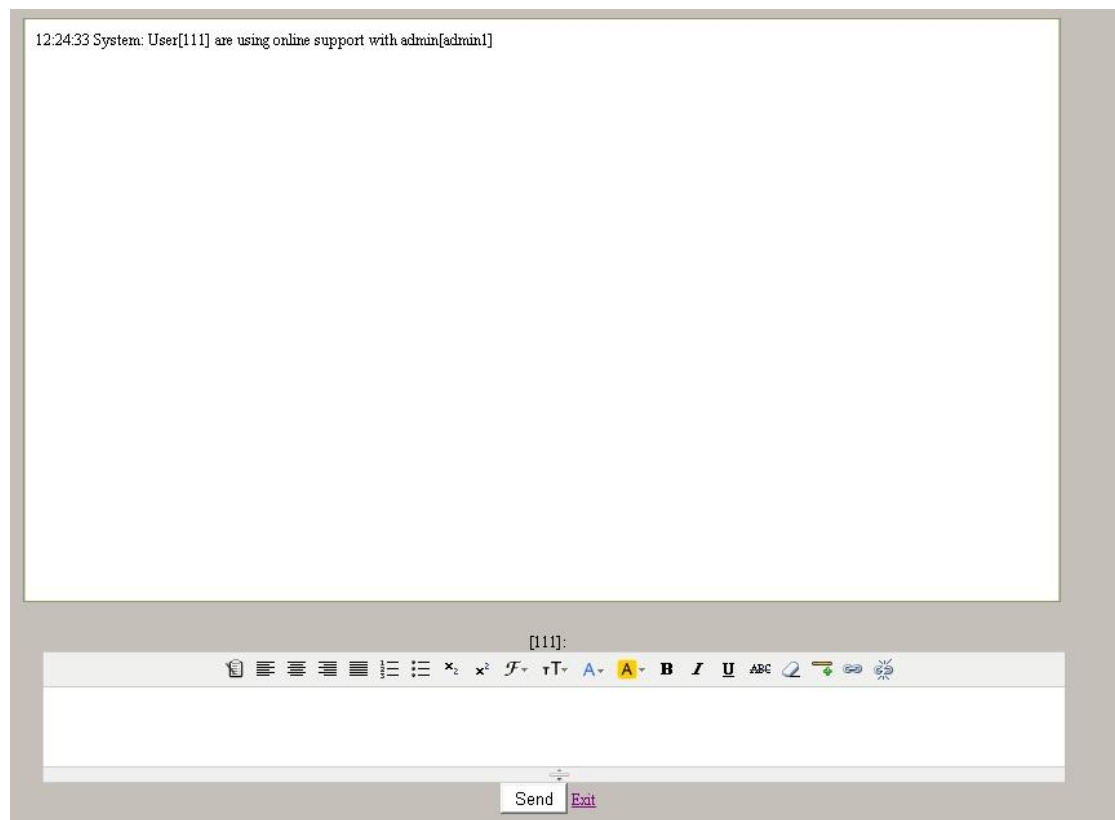


Fig. 29. Interface of Chatting

5. TESTING

In the project, the black box testing is mainly used for my project, which is one of the most common software testing methods to test the web site, after the web site being created. The black box testing is known as the testing method, which doesn't necessarily require users to be able to have the knowledge of internal design or code etc. Based on the nature of black box, it is widely recognized that there is no knowledge of internal logic or code structure is required. The types of testing for this strategy are mainly focused on the testing for requirements and functionality of the software application. In Black Box, there're seven techniques: Equivalent Class Testing, Boundary Value Testing, Decision Table Testing, Pairwise Testing, State-Transition Testing, Domain Analysis Testing, Use Case testing. /9/

This project use black box testing to find out the following errors:

- Function does not correctly or missing
- Interface errors
- Database access errors
- Initializing and terminating errors

For the main feature of black box: test application without the internal logic of the application and code. The process of testing is aimed to click all buttons, make sure all functions work normally. Therefore, the testing process is unnecessary to be displayed. The main results of testing are shown as tables:

Table 1. test-case-01: Login

Purpose:	Testing the function of login, make sure users allowed to log into the system with the correct user name and password.
Test Data:	user name={right user name, wrong user name, empty} password={right password, wrong password, empty}
Steps:	1. Fill in user name and password 2. Click "login" button
Test results:	1. User success log into the system with the correct user name and password, after click "login" button. 2. User gets warning that user name or password is incorrect, after click "login" button. 3. User get warning that user have to fill all information, when user click "login" button.

Table 2. test-case-02: Register

Purpose:	Testing the register function, check the new user information whether insert into database or not.
-----------------	--

Test Data:	user name={one character, eleven characters, empty} password={one character, eleven characters, empty} telephone number={one number, eleven numbers, character, empty} email={character, empty} last name={one character, eleven characters, empty} first name={one character, eleven characters, empty}
Steps:	1. Fill in user name, password, telephone number, email, last name, first name. 2. Click "register" button
Test results:	1. New information of user is inserted into database, after user click "register" button with all correct information. 2. User get warning that user have to fill all information, when user click "register" button without fill in all information. 3. Telephone number is only allowed fill in with the numbers.

Table 3. test-case-03: Reservation

Purpose:	Testing the users reserve books whether success or not.
Test Data:	book id user name date state
Steps:	1. Click "reserve" button. 2. Select the date of reservation. 3. Click "confirm" button. 4. Click "send" button.
Test results:	1. User get note that display reserve success. The information of reservation is displayed in reservation page. 2. User get note that display reserve failed, due to user have already reserve a same book. The information of reservation is not displayed in reservation page. 3. User get note that display reserve failed. There is no more available book in the local library. The information of reservation is not displayed in reservation page.

Table 4. test-case-04: Suggestion

Purpose:	Testing whether suggestion information display correct or not.
Test Data:	book name author category borrowed times
Steps:	1. Browse the details of books.

Test results:	<ol style="list-style-type: none">1. Display the books which have the same category with the book of user is browsing.2. Display the books which have been borrowed by others.
----------------------	---

Table 5. test-case-05: Online Support

Purpose:	Testing user can use online support system to chat with the administrator.
Test Data:	chat file name chat file content
Steps:	<ol style="list-style-type: none">1. Click the name of online administrator.2. Input text in saying area.3. Click "send" button.
Test results:	<ol style="list-style-type: none">1. The name of chat file is displayed by user name and date.2. All text which inputted by user are stored in the chat file.

6. CONCLUSIONS

Having done the project, I have learned not only the programming skills, advanced PHP, advanced MySQL, but also have come up with the innovative idea that could make our society a better place.

This online library assisting system is particularly designed for the college library that there are few users borrowing books in the local library daily. The basic function is designed for users to browse the information of books online. Users use the reservation system to get reservation ID online, and borrow the books in the local library with the reservation ID. The most convenient function is the online support system. Users are allowed to get the support online by chatting with the administrators.

Regrettably, the system I intended to design is still slightly drawback. The online system is worked independently with the local library system. Therefore, when the data of the local library system is updated, the data of online assisting system will not automatically update. Administrators need to update the quantity of books in stock manually, when users return the books back to the local library.

Most difficulty I have had during the course of my project was mainly in JavaScript. I have learned little about it. Therefore, I have to study it during implementing my web site. There are some other challenges during designing the website. Finally, these challenges are overcome with the help of my supervisor Mr. Thai Bui.

Having solved these technical problems, I have been able to be a more sophisticated programmer as the IT student who is majored in IT.

Last but not least, I am profoundly privileged that I have had the opportunity to get involved in this project, and I am honored to have worked with my project supervisor Mr. Thai Bui. There is no doubt he plays an important role for my project work in leading me into the right directions to success. I am deeply thankful for the contributions he has made and the dedication he has exemplified. Having completed this project, I am convinced that I will be able to adapt to the challenge of intensified competition in the 21 century.

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8. LIST OF APPENDICES

8.1. Sequence Diagram

8.1.1.1. Users Browse books Sequence Diagram

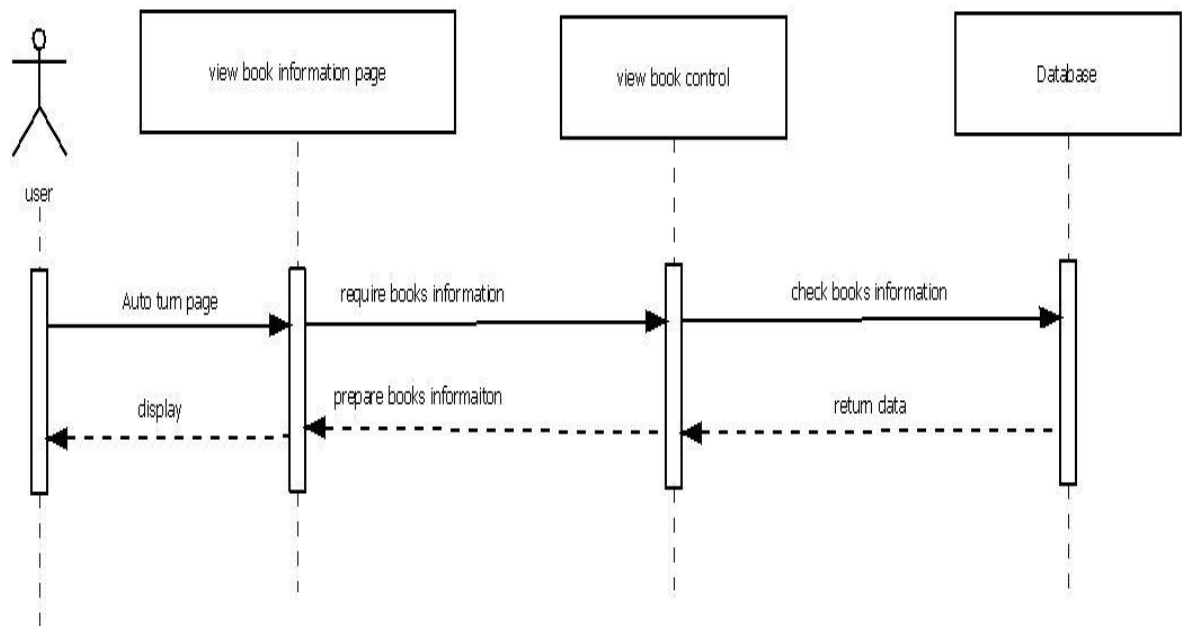


Fig. 30. Users Browse Books Sequence Diagram

Figure 30 describes the sequence when users browse books page.

8.1.1.2. Users Browse Books Detail Sequence Diagram

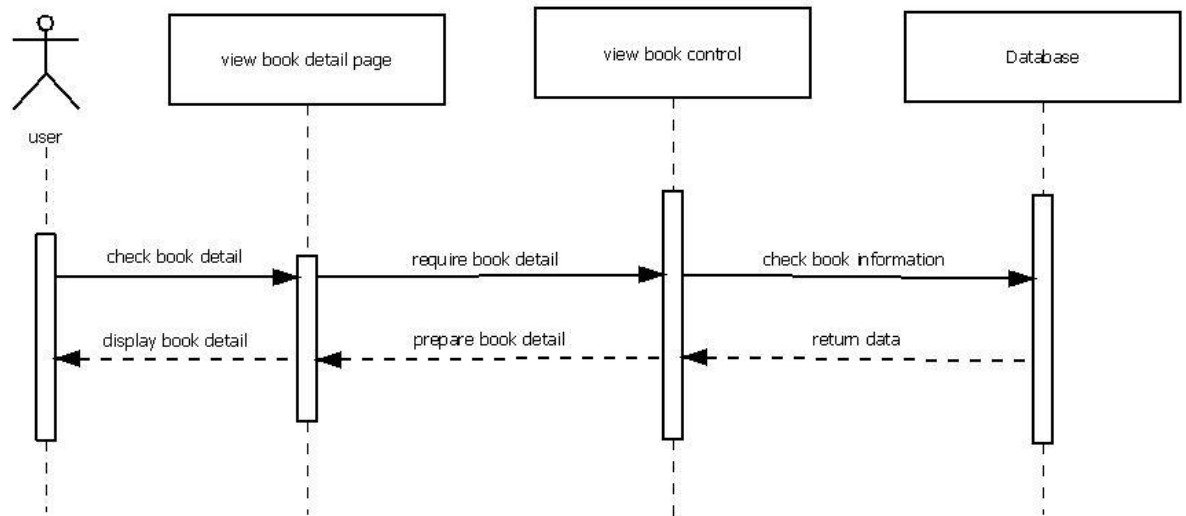


Fig. 31. Users Browse Books Detail Sequence

Figure 31 describes the sequence when users browse detail of books.

8.1.1.3. Users Check Reservations Sequence Diagram

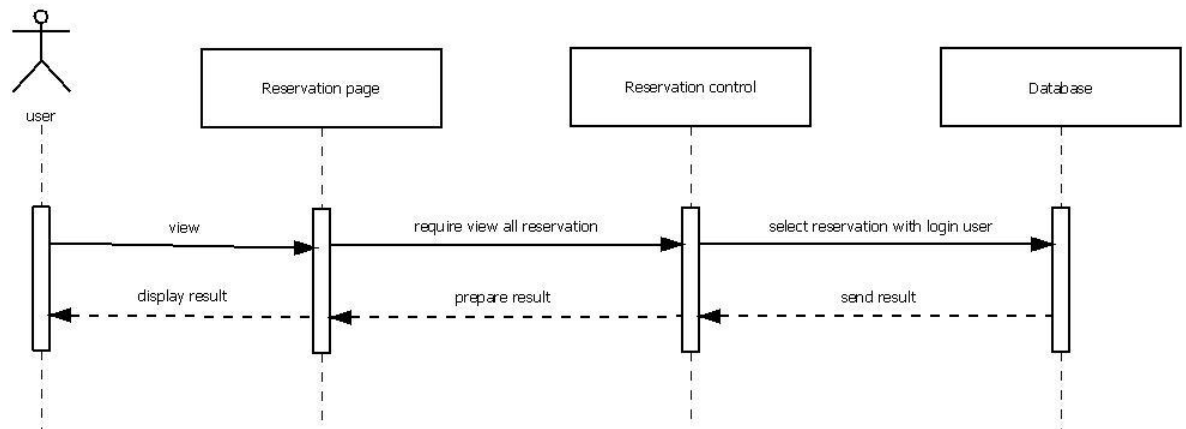


Fig. 32. Users Check Reservations Sequence Diagram

Figure 32 describes the sequence when users check the reservations that they have made.

8.1.1.4. Users Cancel Reservations Sequence Diagram

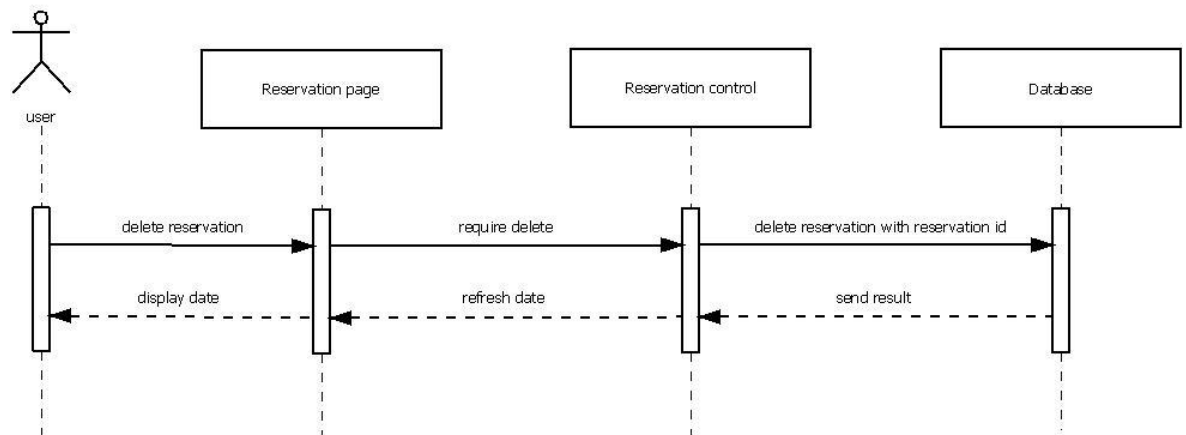


Fig. 33. Users Cancel Reservations Sequence Diagram

Figure 33 describes the sequence when users cancel the reservations they made. The reservations can be canceled before administrators make the preparation.

8.1.1.5. Administrators Browse Reservations Sequence Diagram

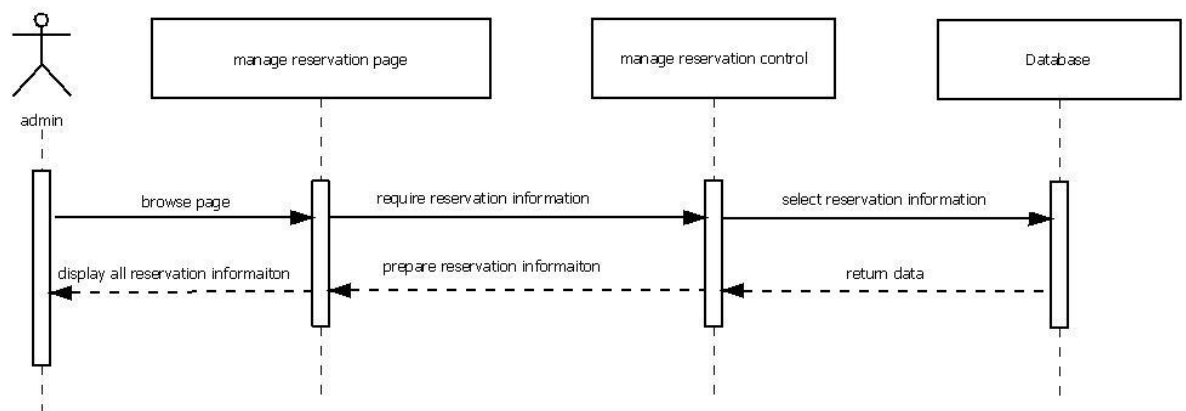


Fig. 34. Administrators Browse Reservations Sequence Diagram

Figure 34 describes the sequence when the administrators browse manage reservations' page.

8.1.1.6. Administrators Change State of Reservations Sequence Diagram

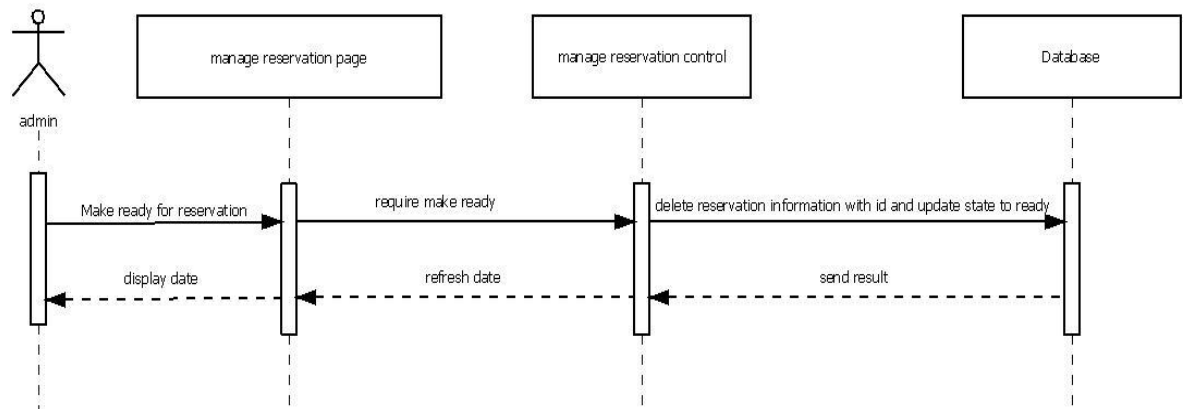


Fig. 35. Administrators Change State of Reservations Sequence Diagram

Figure 35 describes the sequence when administrators make the state of reservations to “ready”.

8.1.1.7. Administrators Check Notes Sequence Diagram

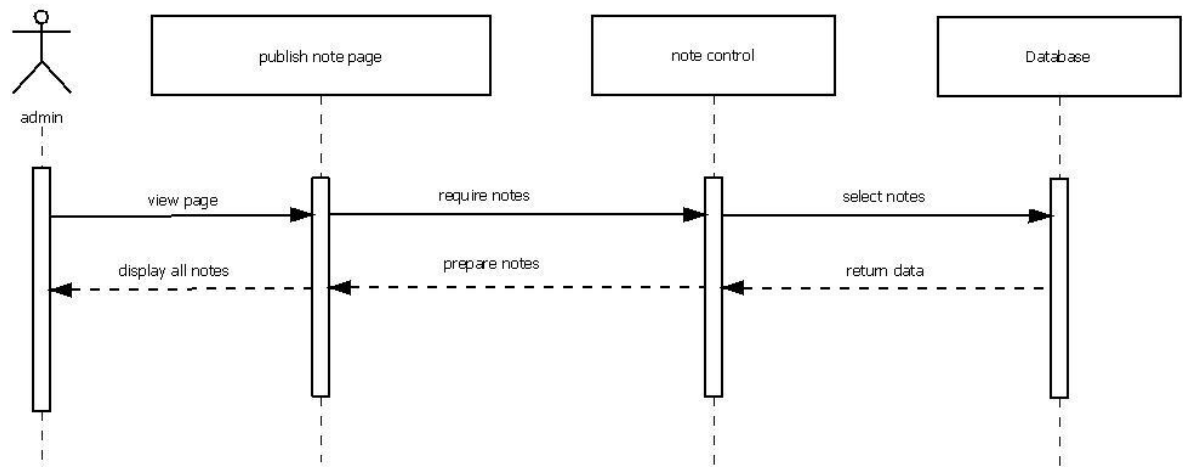


Fig. 36. Administrators Check Notes Sequence Diagram

Figure 36 describes the sequence when administrators browse manage note page.

8.1.1.8. Administrators Publish Notes Sequence Diagram

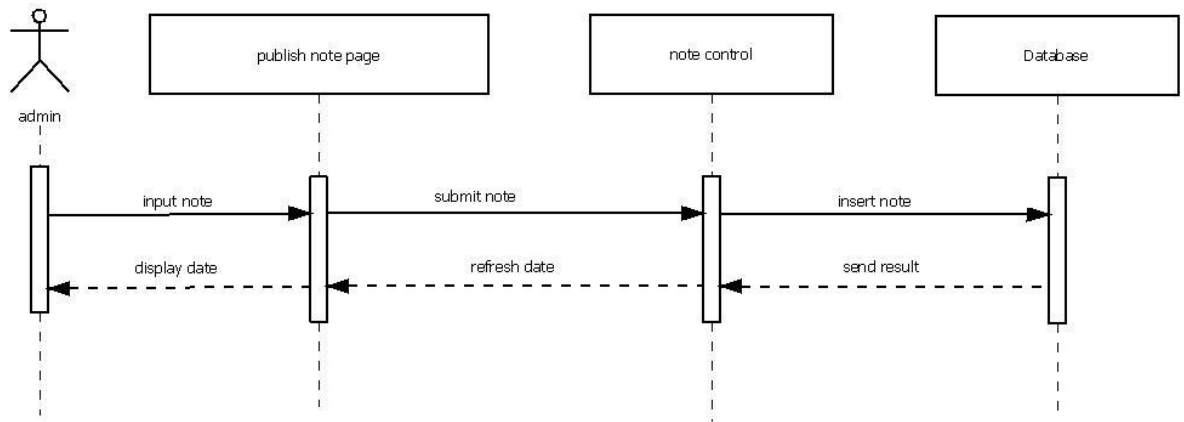


Fig. 37. Administrators Publish Notes Sequence Diagram

Figure 37 describes the sequence when administrators publish new note. Administrators can use text editor to edit the style of font. The text editor supports WYSIWYG (what you see is what you get) function.

8.1.1.9. Administrators Delete Notes Sequence Diagram

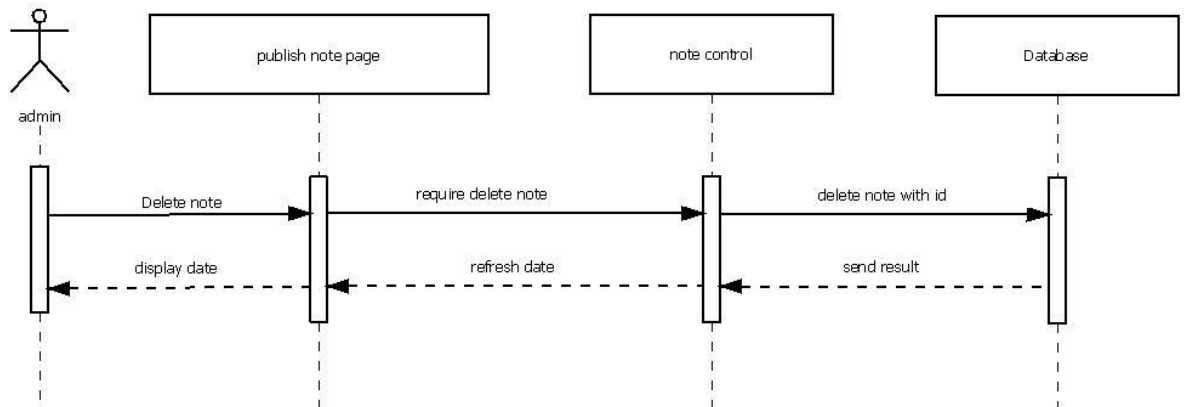


Fig. 38. Administrators Delete Notes Sequence Diagram

Figure 38 describes the sequence when administrators delete notes.

8.1.1.10. Administrators Browse Books Sequence Diagram

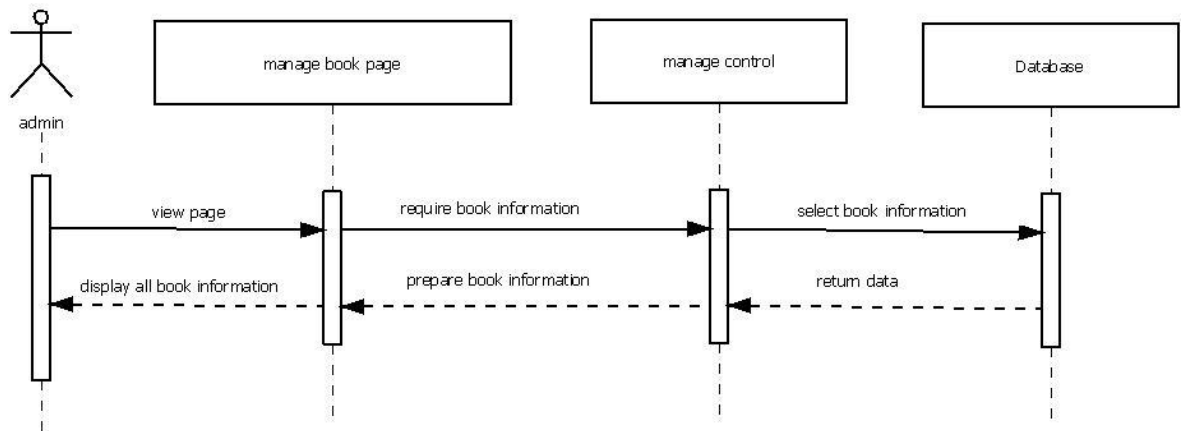


Fig. 39. Administrators Browse Books Sequence Diagram

Figure 39 describes the sequence when administrators browse the manage book page.

8.1.1.11. Administrators Add Books Sequence Diagram

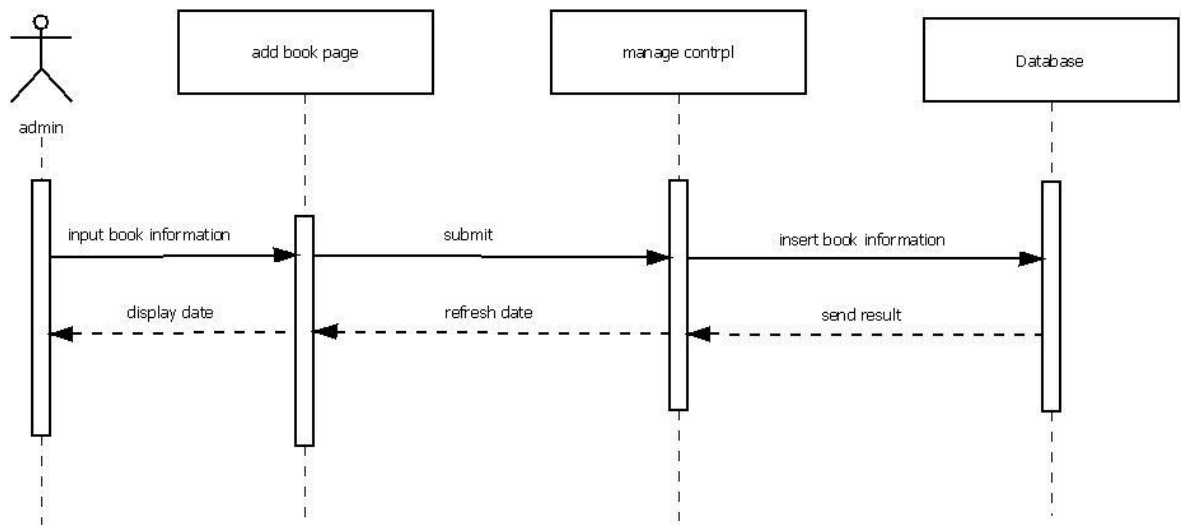


Fig. 40. Administrators Add Books Sequence Diagram

Figure 40 describes the sequence when administrators add new books.

8.1.1.12. Administrators Edit Books Sequence Diagram

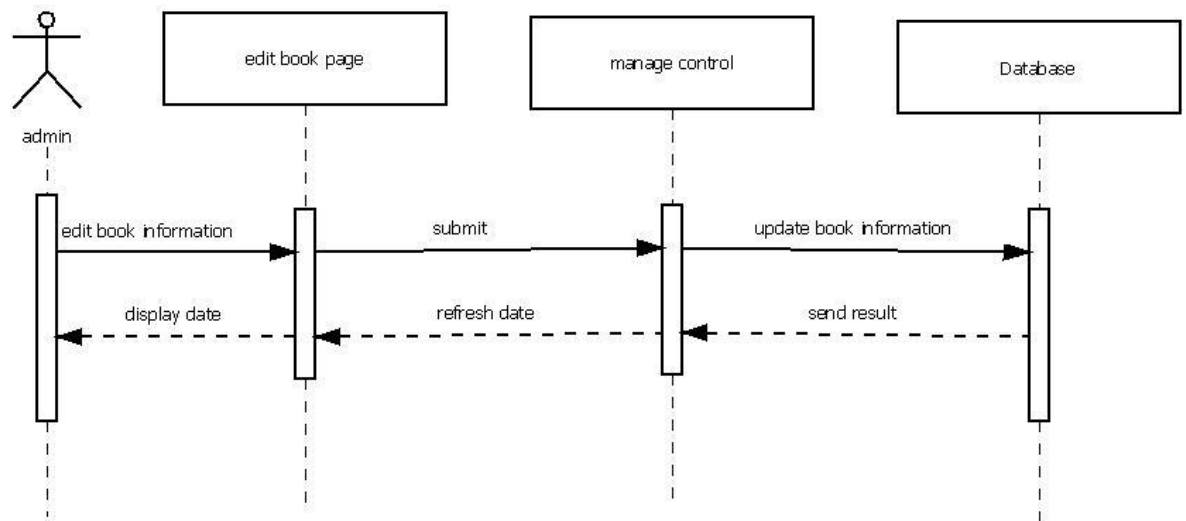


Fig. 41. Administrators Edit Books Sequence Diagram

Figure 41 describes the sequence when administrators edit books. Administrators can edit books information without the image of books.

8.1.1.13. Administrators Delete Books Sequence Diagram

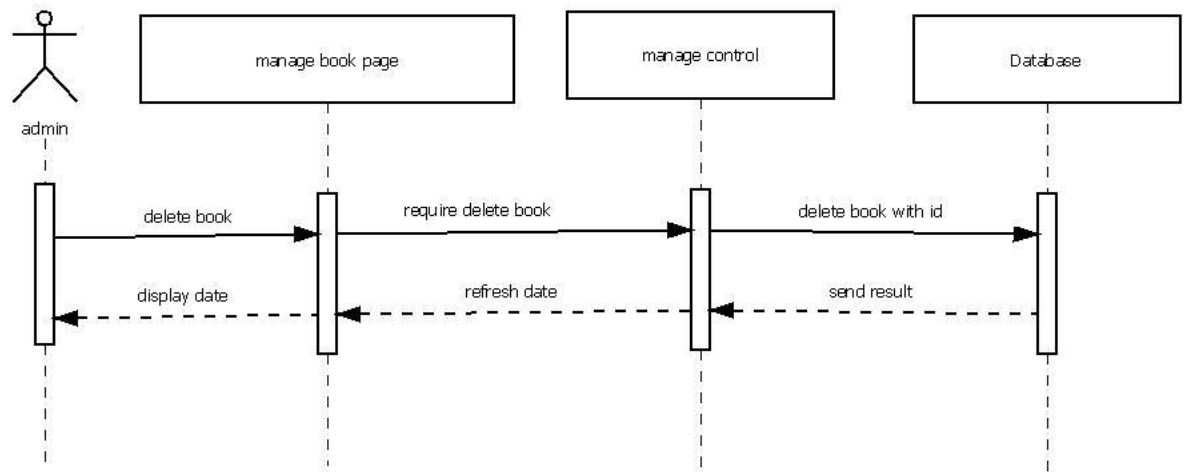


Fig. 42. Administrators Delete Books Sequence Diagram

Figure 42 describes the sequence when administrators delete books.

8.1.1.14. Administrators Check Reservations List Sequence Diagram

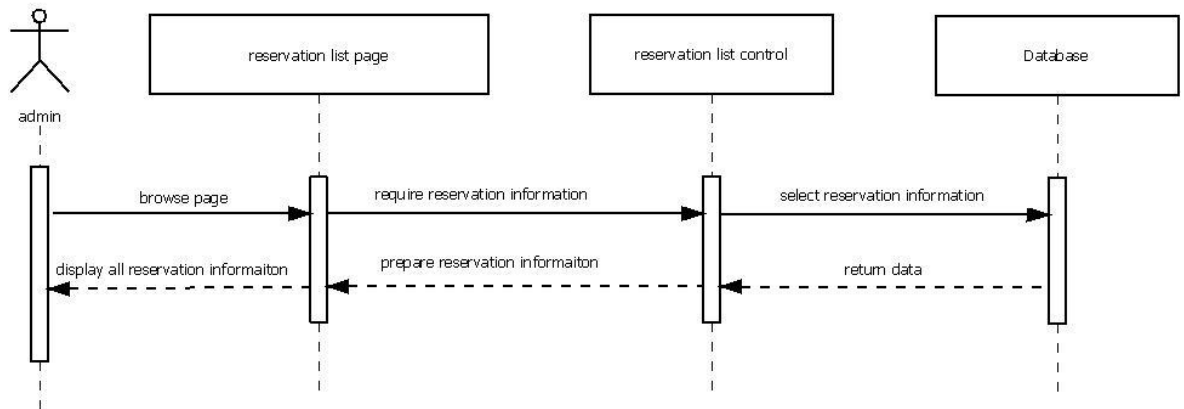


Fig. 43. Administrators Check Reservations List Sequence Diagram

Figure .43 describes the sequence when administrators browse reservations list page.

8.2. Use Case Table

Use case tables show below:

Table 6. Register

Use Case ID:	1	Use Case Name:	Register
Actors:	All users		
Description:	Users register to the system.		
Trigger:	None		
Preconditions:	None		
Normal Flow:	1. Fill in all information 2. Check whether fill in all table 3. Check whether user name available 4. Save information to database		
Exceptions:	1.E If users do not fill in all table 1. System informs users 2.E If user name already registered 2. System informs users and turn back to the register page		
Notes and Issues:	None		

Table 7. Login

Use Case ID:	2	Use Case Name:	Login
Actors:	All users		

Description:	Users log into the system.
Trigger:	Anti-Intrusion System
Preconditions:	1. Register
Normal Flow:	1. Fill in user name and password 2. Check whether fill in all table 3. Check whether user name or password correct 4. Turn to users' part or administrators' part automatically
Exceptions:	1.E If users do not fill in all table 1. System informs users 2.E If user name or password not correct 2. System informs users and turn back to login page
Notes and Issues:	None

Table 8. Browsing Books

Use Case ID:	3	Use Case Name:	Browse books
Actors:	Users		
Description:	Users browse books.		
Trigger:	Auto turn page when users log in		
Preconditions:	1. Log in		
Normal Flow:	1. Click "browse books" button in navigation bar		
Exceptions:	None		
Notes and Issues:	None		

Table 9. Browsing Books' Detail

Use Case ID:	4	Use Case Name:	Browse books' detail and interrelated books
Actors:	Users		
Description:	Users browse books' detail. View interrelated books provided with the suggestion system.		
Trigger:	None		
Preconditions:	1. Log in 2. Click "browse books" button in navigation bar		
Normal Flow:	1. Click "view detail" button		
Exceptions:	None		
Notes and Issues:	None		

Table 10. Reserving Books

Use Case ID:	5	Use Case Name:	Reserve books
Actors:	Users		
Description:	Users make reservations for books		
Trigger:	None		

Preconditions:	1. Log in 2. Click “browse books” button in navigation bar 3. Click “view detail” button
Normal Flow:	1. Click “Reservation” button 2. Select reservations date 3. Confirm reservation and click “send” button 4. Check reservations whether it is available or not
Exceptions:	1.E Users already reserved the same book 1. Back to browse books’ detail 2.E The books’ quantity in stock are not available 1. Back to browse books’ detail
Notes and Issues:	None

Table 11. Searching Books

Use Case ID:	6	Use Case Name:	Search books
Actors:	Users		
Description:	Users search books		
Trigger:	None		
Preconditions:	1. Log in		
Normal Flow:	1. Click “search books” button in navigation bar 2. Input key words and click “search” button		
Exceptions:	1.E There is not any result 1. Click “back” button and search another key words		
Notes and Issues:	None		

Table 12. Checking Reservations

Use Case ID:	7	Use Case Name:	Check reservations
Actors:	Users		
Description:	Users check reservations’ state		
Trigger:	None		
Preconditions:	1. Log in		
Normal Flow:	1. Click “check reservation” button in navigation bar 2. Users can delete reservations with click “delete” button if the button is available		
Exceptions:	None		
Notes and Issues:	Reservations have three states: wait, ready and finish. Wait means administrators have not prepared users’ reservations. Ready means administrators have prepared users’ reservations. Finish means these reservations have done.		

Table 13. Users’ Online Supporting

Use Case ID:	8	Use Case Name:	Online Support
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Actors:	Users
Description:	Users can get online support by administrators with the chatting
Trigger:	None
Preconditions:	1. Log in
Normal Flow:	1. Click "online support" button in navigation bar 2. Select a available administrator start to chat
Exceptions:	1.E There is no available administrator online 1. Waiting. Page refresh automatically.
Notes and Issues:	None

Table 14. Managing Account

Use Case ID:	9	Use Case Name:	Manage account
Actors:	Users		
Description:	Users edit account information		
Trigger:	None		
Preconditions:	1. Log in		
Normal Flow:	1. Click "account" button in navigation bar 2. Input new users information		
Exceptions:	1.E If users do not fill in all table 1. System informs users 2.E If users want to change new password 1. Users must input old password		
Notes and Issues:	None		

Table 15. Browsing Reservations List

Use Case ID:	10	Use Case Name:	Browse reservations list
Actors:	Administrators		
Description:	Administrators browse reservations list		
Trigger:	None		
Preconditions:	1. Log in		
Normal Flow:	1. Choose "reservation list" option and click "go" button		
Exceptions:	None		
Notes and Issues:	None		

Table 16. Managing Reservations

Use Case ID:	11	Use Case Name:	Manage reservations
Actors:	Administrators		
Description:	Administrators manage reservations. Administrators prepare the reservations, then click "ready" button make it ready.		
Trigger:	None		
Preconditions:	1. Log in		

Normal Flow:	1. Choose “manage reservation” option and click “go” button 2. Click “ready” button if the reservations is prepared
Exceptions:	None
Notes and Issues:	None

Table 17. Managing Notes

Use Case ID:	12	Use Case Name:	Manage notes
Actors:	Administrators		
Description:	Administrators manage notes. Administrators are allowed to add and delete notes.		
Trigger:	None		
Preconditions:	1. Log in		
Normal Flow:	1. Choose “manage notes” option and click “go” button 2. Click “delete” button to delete notes 3. Using text editor to edit text and click “send” button		
Exceptions:	1.E If users do not fill in all table 1. System informs users		
Notes and Issues:	None		

Table 18. Managing Books

Use Case ID:	13	Use Case Name:	Manage books
Actors:	Administrators		
Description:	Administrators manage books. Administrators are allowed to add, edit and delete notes. Administrators can easy to find a book with the search function in this page.		
Trigger:	None		
Preconditions:	1. Log in		
Normal Flow:	1. Choose “manage books” option and click “go” button 2. Click “delete” button to delete books 3. Click “edit” button to edit books 4. Click “add” button to add books 4. Input books’ key words to search books		
Exceptions:	1.E There is not any result 1. Click “back” button and search another key words		
Notes and Issues:	None		

Table 19. Administrators’ Online Supporting

Use Case ID:	14	Use Case Name:	Online support
Actors:	Administrators		
Description:	Administrators provide online support with the online chat		
Trigger:	None		

Preconditions:	1. Log in
Normal Flow:	1. Choose "online support" option and click "go" button 2. Select a available user start to chat
Exceptions:	1.E There is no users online 1. Waiting. Page refresh automatically.
Notes and Issues:	None