

# **Database Management Systems**

## **(COP 5725)**

Spring 2015

Instructor: Dr. Markus Schneider

## **Project phase II:**

**Movie Database Management system**

***FirstView***

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## Part I Overview of Project:

The aim of our proposed project is to design and develop a movie database management system—FirstView as described in the last phase of this project. The motivation of this project is to establish a platform that involves both the public customers and cinema administrator users. By using the system, people shall get access to acknowledge the movies information according their preferences, while the cinema shall be able to conduct business interactions with customers as well as be acquainted with their state of operation. The main functions to be achieved are listed as follows:

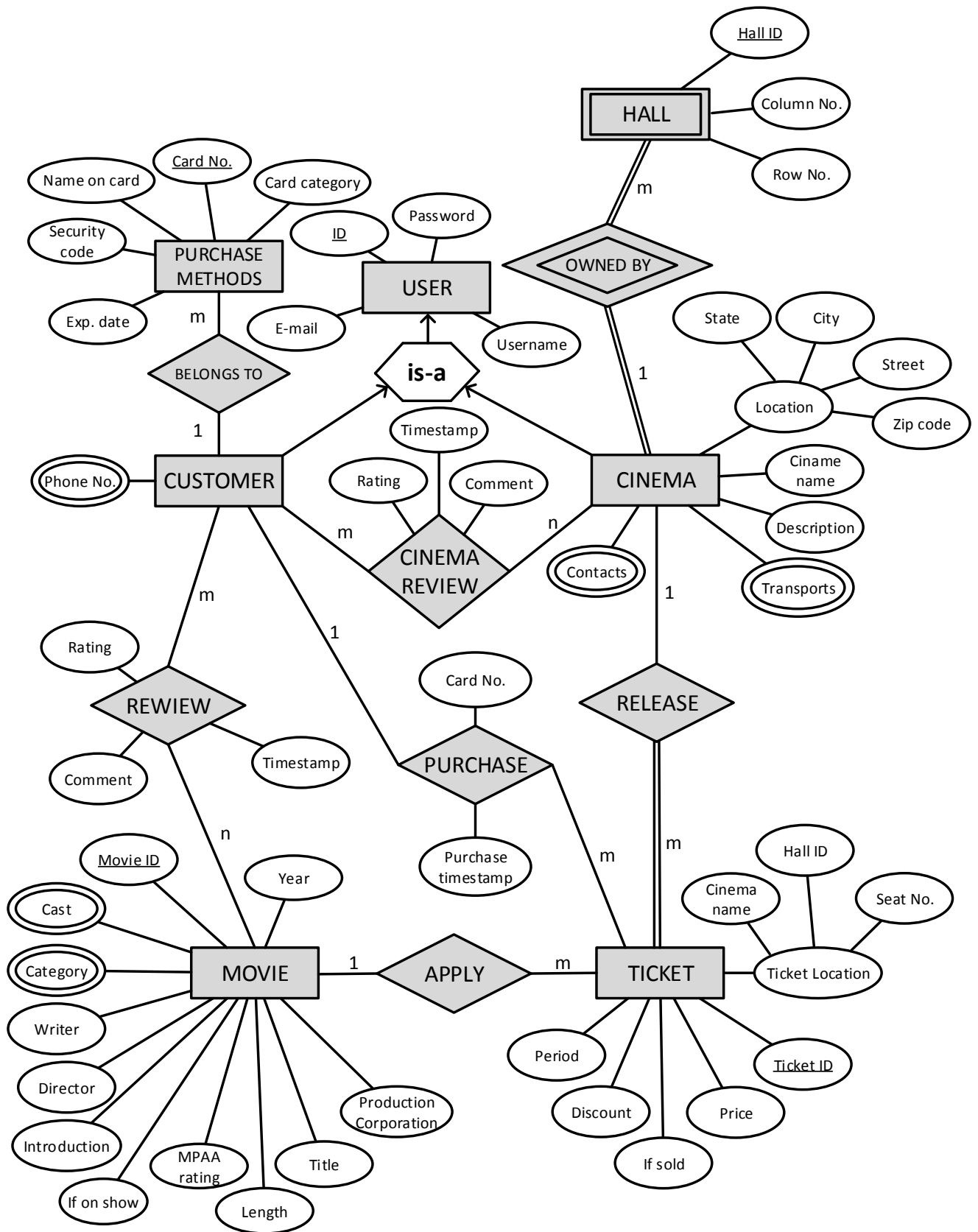
- A. Queries with respects to movies and cinemas;
- B. Tickets purchase according to customers' preference;
- C. Ticket and schedule management with financial analysis of cinema.

In this phase period, the overall *conceptual database design* is described through an Entity-Relationship (ER) diagram and relational model so that the important entity sets and relationship sets along with their attributes are identified; In addition, the *user interface design* has been performed to devise a set of web pages that convey the promised functionalities of the proposed system. Detailed descriptions of the flow of action and expected webpage are included as well.

## Part II Conceptual Database Design

In this section, an ER schema diagram for the movie database system is designed to depict and describe data as entities, relationships and attributes in Figure 1. The descriptions of the ER diagram are as follows:

- There are two types of users: customers and cinemas. Each user can be uniquely identified by an ID. Also a user needs to provide its username and password. Email address can be provided as optional information of the user.
- Customer users can choose to provide one or more phone numbers in the system.
- Customer needs to provide purchase methods if he or she wishes to make a purchase. The purchase method information requires the card number as a key, card category, name on card, security code and expiration date.
- Review including a rating scaled from 0 to 5 and comments can be added by customers to movies or cinemas. A timestamp is generated once the review is made.
- Each cinema must have its name and location including state, city, street and zip code. A cinema administrator can add description, contacts and transports information.
- Each cinema consists of projection halls to display the movies. Hall ID is not enough to distinguish the projection halls without cinema's user ID. For each hall, column number and row number of seats need to be provided.
- A unique movie ID is assigned to each movie. Among the movie information, it contains its title, year, length, category, Motion Picture Association of America (MPAA) rating as well as its writer, director, casts, production corporation and introduction. Other than the movie ID, a movie can also be distinguished by the combination of its title with year. Several main actors may be included in the cast attribute. One movie is not limited to be categorized in one category. An *"if\_on\_show"* indicator is attached to check if the movie can be currently found in any cinema.
- Tickets applying on certain movies must be released by cinemas. Each ticket can be uniquely identifiable by its ticket ID. Moreover, a ticket contains the following information: location consisting of cinema name, Hall ID and seat number, time period, price and discount. An *"if\_sold"* indicator checks the availability of the ticket.
- Customer can make purchase of tickets. Once a purchase is made, the card number applied is recorded and a purchase timestamp is generated simultaneously.



**Figure 1.** ER schema diagram of the movie database management system

In the ER diagram, the primary key is clearly marked with underline for each entity set. For each relationship identified, the cardinalities (1:1, 1:m or m:n) are stated on the entities participating in this relationship.

For application purpose, we also performed a mapping from ER diagram to a relationship model. The relational model represents the database as a collection of relations, each of which informally resembles a table of values. For each relation set and relation set, its attributes and corresponding definition are described as below:

- **USER** (ID : integer, Username : varchar, password : varchar, E-mail : varchar);  
PRIMARY KEY: ID.
- **CUSTOMER** (ID : integer);  
PRIMARY KEY: ID.
- **CUSTOMER\_PHONE** (Phone No. : varchar, Cust ID : integer);  
PRIMARY KEY: Phone\_No., Cust\_ID;  
FOREIGN KEY: Cust\_ID referencing **CUSTOMER**;  
*Note: Multivalued Attribute of CUSTOMER.*
- **PURCHASE\_METHODS** (Card No. : varchar, Card category : varchar, Name on Card : varchar, Security code : varchar, Exp. date: date, Cust ID : integer) ;  
PRIMARY KEY: Card No., Cust\_ID;  
FOREIGN KEY: Cust\_ID referencing **CUSTOMER**.
- **CINEMA** (ID : integer, Cinema name : varchar, Location(State: varchar, City : varchar, Street : varchar, Zip code: integer), Description : varchar)  
PRIMARY KEY: ID.
- **HALL** (Cine ID : integer, Hall ID : integer, Column No. : integer, Row No. integer)  
PRIMARY KEY: Cine\_ID, Hall\_ID;  
FOREIGN KEY: Cine\_ID referencing **CINEMA**.
- **CINEMA\_CONTACT** (Contacts : varchar, Cine ID : varchar)  
PRIMARY KEY: Contacts, Cine\_ID;  
FOREIGN KEY: Cine\_ID referencing **CINEMA**;  
*Note: Multivalued Attribute of CINEMA.*
- **CINEMA\_TRANS** (Transports : varchar, Cine ID : varchar)  
PRIMARY KEY: Transports, Cine\_ID;  
FOREIGN KEY: Cine\_ID referencing **CINEMA**;  
*Note: Multivalued Attribute of CINEMA.*

- **MOVIE** (Movie ID : integer, Title : varchar, Year : date, Rated : varchar, Length : integer, If on show : integer, Director : varchar, Writer : varchar, Production Corporation : varchar, Introduction : varchar)  
PRIMARY KEY: Movie\_ID;  
ALTERNATE KEY: Title, Year.
- **MOVIE\_CAST** (Cast : varchar, Movie ID : integer)  
PRIMARY KEY: Casts, Movie\_ID;  
FOREIGN KEY: Movie\_ID referencing **MOVIE**;  
*Note: Multivalued Attribute of Movie.*
- **MOVIE\_CATAGORY** (Category : varchar, Movie ID : integer)  
PRIMARY KEY: Category, Movie\_ID;  
FOREIGN KEY: Movie\_ID referencing **MOVIE**;  
*Note: Multivalued Attribute of Movie.*
- **MOVIE\_REVIEW** (Cust ID : integer, Movie ID : integer, Timestamp : date, Rating : integer, Comment : varchar)  
PRIMARY KEY: Cust ID, Movie ID;  
*Note: Cardinality m:n relationship.*
- **TICKET** (Ticket ID : string, Movie ID : integer, Cine ID : integer, Cust ID : integer, Ticket location(Cinema name : varchar, Hall No.: varchar, Seat No.: varchar), Price : numeric, Discount : float, Period : interval, Purchase timestamp : date, Card No. : varchar, If sold : integer)  
PRIMARY KEY: Ticket ID.
- **CINEMA\_REVIEW** (Cine ID : integer, Cust ID : integer, Timestamp : date, Rating : integer, Comment : varchar)  
PRIMARY KEY: Cine\_ID, Cust\_ID;  
*Note: Cardinality m:n relationship.*

## Part III User Interface Design

In this section, the *user interface design* has been performed to devise a set of web pages that convey the promised functionalities of the proposed system. Detailed descriptions of the flow of action and expected webpage are included as well.

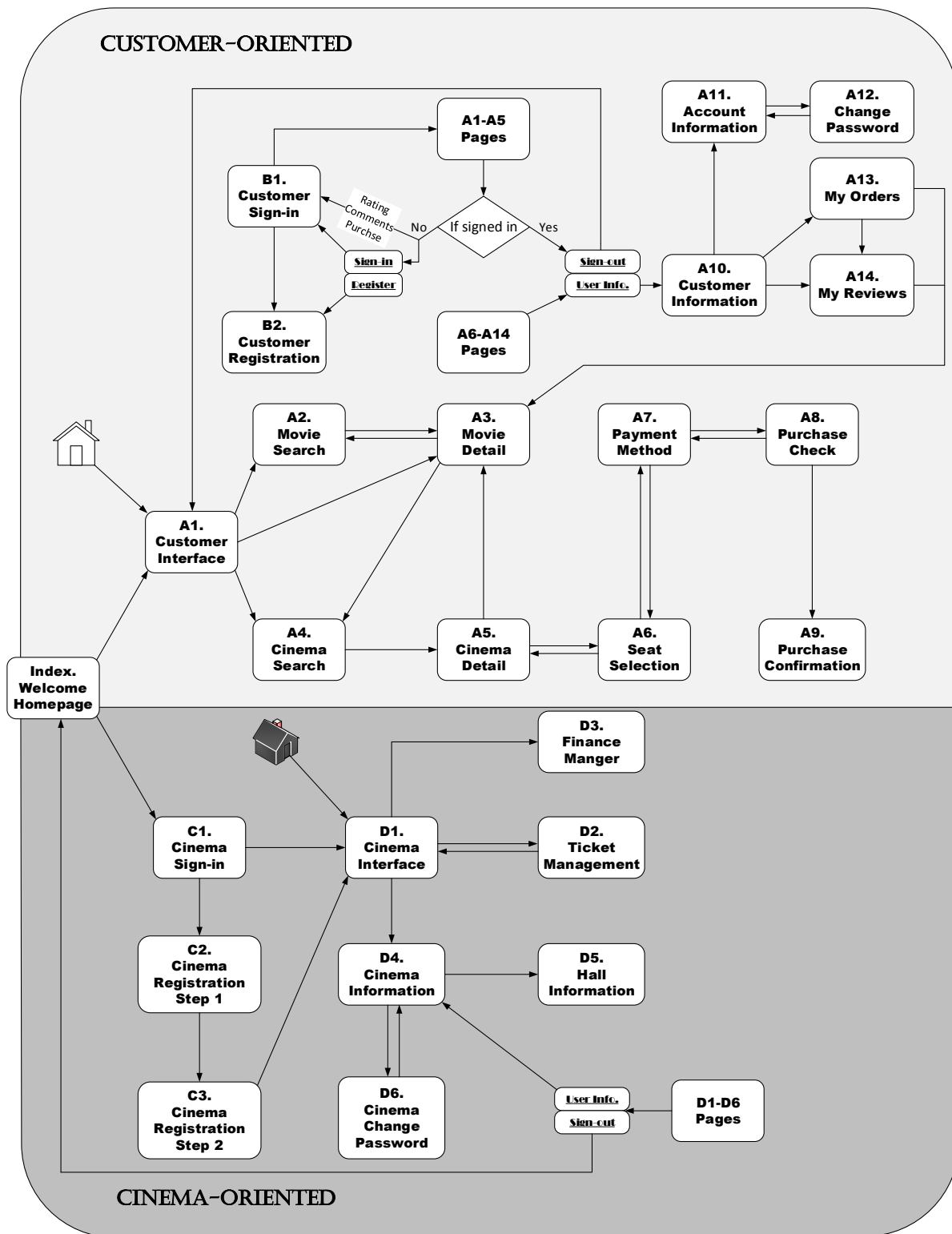


Figure 2. General flow of action the movie database management system

Figure 2 shows a general flow of action associated with each specific webpage in the proposed movie database management system.

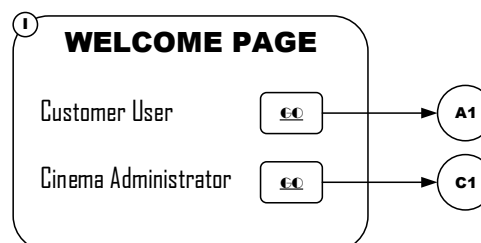
Apart from the “Welcome Homepage”, there are two categories of all the webpages: customer-oriented and cinema-oriented webpages, in which, more precisely, contains two blocks respectively.

For the customer-oriented pages, the possible actions involving with the customers’ requirements such as queries of the cinemas and movies information along with purchasing movie tickets are included in block A, while other actions related to customers’ signing in and registering a customer account are maintained in block B. By the same token, the cinema-oriented webpage are divided into Block C and Block D according to their daily actions and account sign-in/registration respectively.

### ❖ Descriptions of Webpages

From here on, we state the detailed descriptions of the functionalities and connections of each webpage. The button, if contains words with underline, implies a link connection to other webpage.

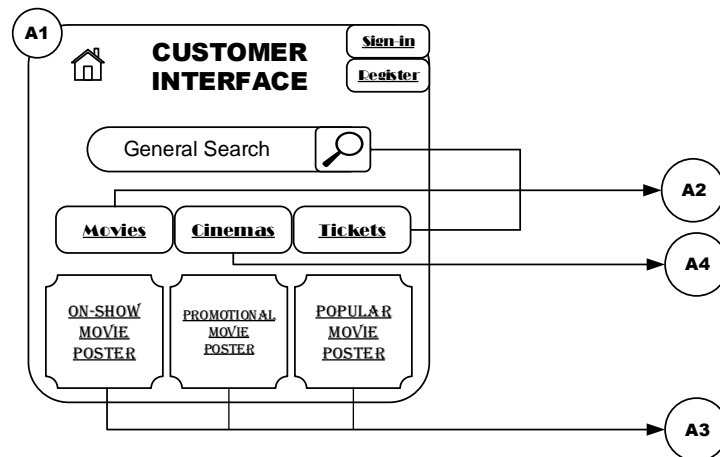
#### INDEX. Welcome Homepage



The welcome homepage is the first page being visited if anyone enters into the movie database management system. It allows the user to choose a customer user entry or a cinema administrator entry by clicking the “GO” button. The two buttons displayed are linked with “A1. Customer Interface Page” and “C1. Cinema Sign-in Page” respectively.

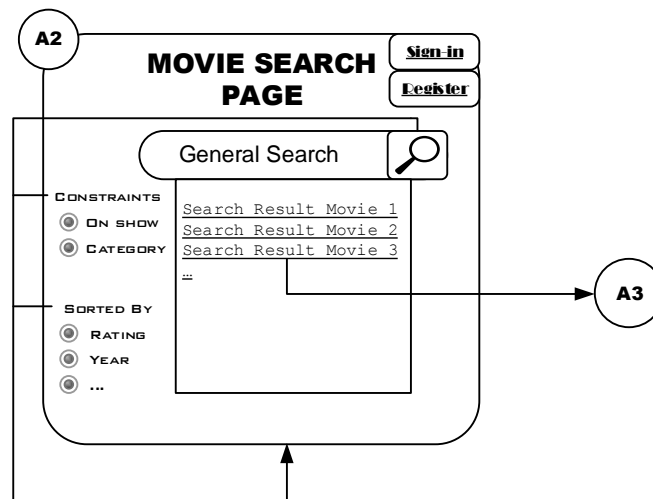


## A1. Customer Interface



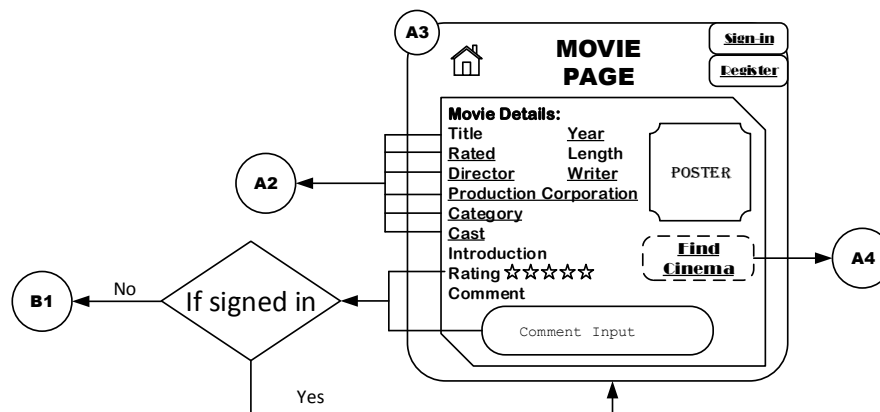
The customer interface page contains a general search bar that can be used to search information about movies. After clicking the magnifying glass, it jumps to “A2. Movie Search Page” associated with the keyword input in the search bar. A click of “Movie” and “Ticket” button also takes one to A2, but only on-shown movies will be displayed if clicking “Ticket”. If “Cinema” button is clicked, the page will be moved to “A4. Cinema Search Page”. Several movie posters are shown at the bottom of A1 page, by clicking which the corresponding movie details will be shown in “A3. Movie Detail Page”.

## A2. Movie Search Page



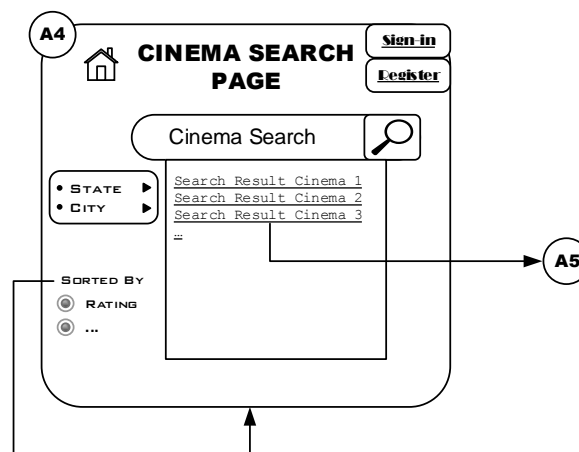
Movie search page allows the customer to search the movie information and display the related links below. Constraints and sorting pattern can be selected according to users’ preference. The link results in the page will be refreshed if any new constraint or sorting pattern is selected. By clicking on the link, it takes the customer to “A3. Movie Detail Page”.

### A3. Movie Detail Page



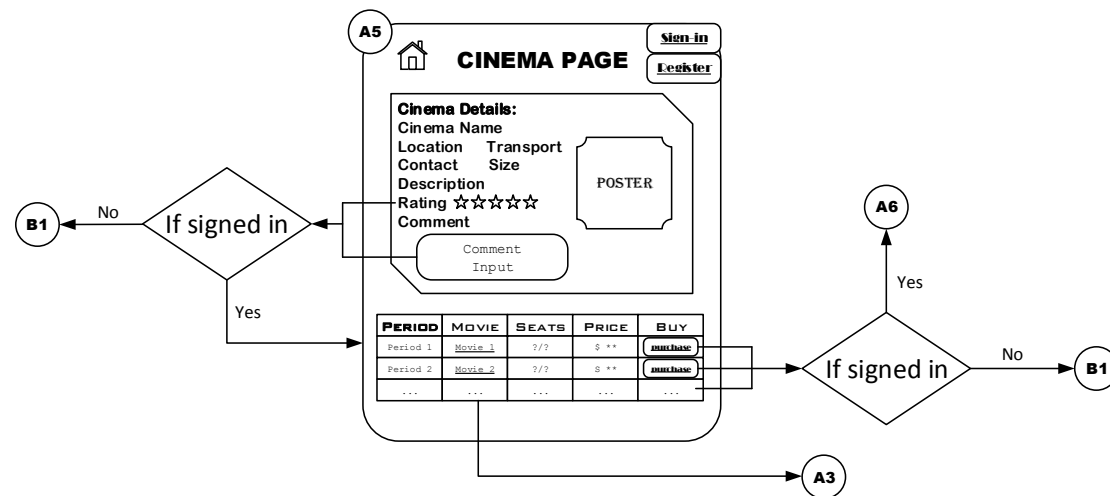
Details of a certain movie are listed in the Movie detail page, including its title, year, MPAA rating (referred as Rated herein), director, cast and so on. If available, by clicking on the certain attributes of the movie, it goes to “A2. Movie Search Page” associated with the keyword input in the search bar to perform a movie search. When the customer wishes to rate or comment on the movie in this page, the system automatically checks whether the user has signed in or not. If not, it takes to “B1. Customer Sign-in Page”. The button “Find Cinema” is only available if the movie is on show currently. By clicking, the page directs to “A4. Cinema Search Page” to search the cinema showing the specific movie.

### A4. Cinema Search Page



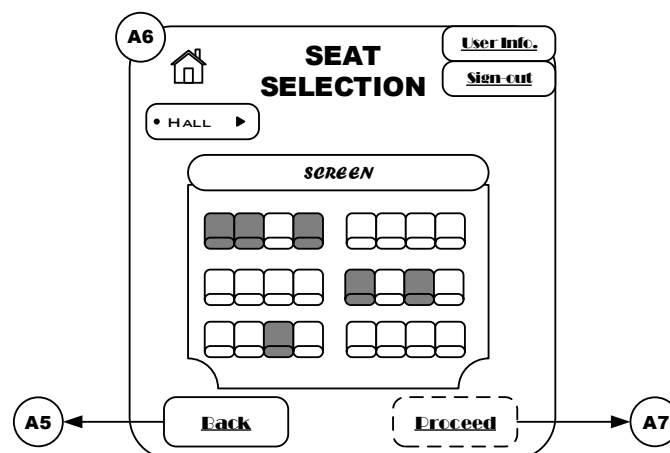
The customer can perform a cinema search in the Cinema search page by input keywords in the search bar. By choosing the state and city, the search engine filters the searching result according to cinemas’ locations. Similar to “A2. Movie Search Page”, sorting pattern can be selected according to users’ preference. The link results in the page will be refreshed if any new sorting pattern is selected.

## A5. Cinema Detail Page



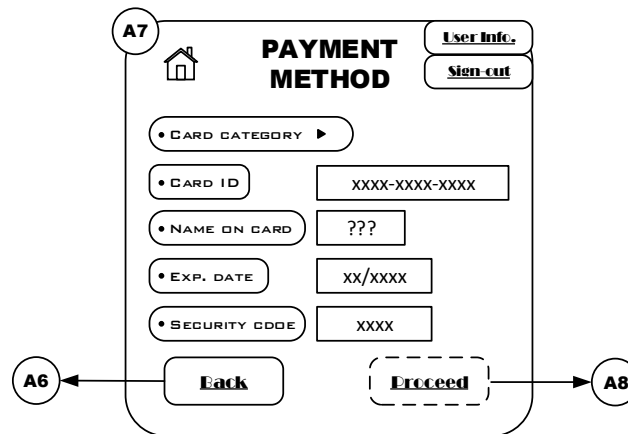
The Cinema detail page displays the detailed information about a certain cinema. As the same rule applied in “Movie Detail Page”, when the customer wishes to rate or comment on the movie in this page, the system automatically checks whether the user has signed in or not. If not, it takes to “B1. Customer Sign-in Page”. A schedule of on-show movie is provided at the bottom of this webpage, which consists of period, movie title, seat occupation and price. Clicking the movie title directs the user to the corresponding “A3. Movie Detail Page”. If one clicks purchase button, it takes to “B1. Customer Sign-in Page” if not signed in, otherwise it proceeds to “A6. Seat Selection Page”.

## A6. Seat Selection Page



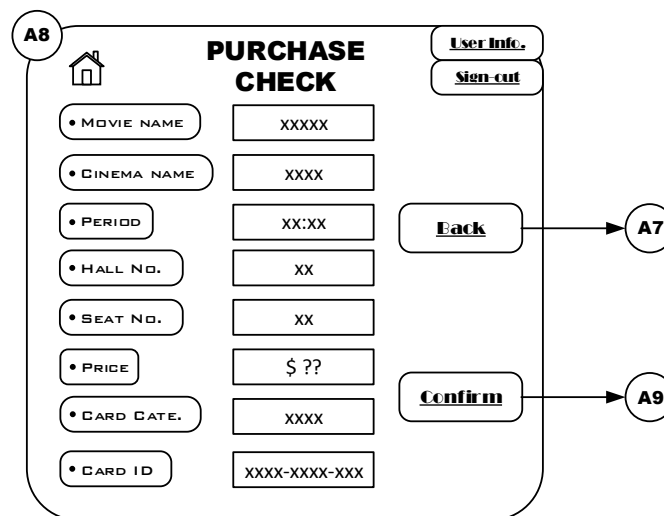
The Seat selection page allows the customers to select the seat for the ticket to be purchased. If available, the hall can be selected as preference. A seat diagram is shown at the bottom of this page, in which the dark seat indicates that it is not available. The “Proceed” button linking to “A7. Payment Method Page” is not available to press without selection of a seat. “Back” button directs to “A5. Cinema Detail Page”.

## A7. Payment Method Page



The Payment method page requires the customers to select the card category and enter the necessary card information to complete a purchase. Again, the “Proceed” button is not available until the card information is complete. “Back” button directs to “A6. Seat Selection Page”.

## A8. Purchase Check Page



This page provides the customer with a last chance to check whether all information involving with the current ticket purchasing is correct. If one finds any problem, the user go back to the previous page by clicking the “Back” button. A clicking of the “Confirm” button assumes the customers’ confirmation of this ticket information and directs to “A9. Confirmation Page.”

## A9. Confirmation Page

The Confirmation Page (A9) features a home icon, a title bar with 'CONFIRMATION PAGE', and a 'User Info.' section with a 'Sign-out' button. The main content area displays a list of ticket details in a two-column format: MOVIE NAME (XXXXX), CINEMA NAME (XXXX), PERIOD (XX:XX), HALL NO. (XX), SEAT NO. (XX), PRICE (\$ ??), and TICKET ID (XXXXX-XXXXX). A vertical barcode is positioned to the right of the details.

The Confirmation page is the final webpage through a process of purchasing a movie tickets. It contains all necessary information of the corresponding movie and cinema as an e-ticket along with an identifiable code bar.

## A10. User Information Page

The User Information Page (A10) includes a home icon, a title bar with 'USER INFO. PAGE', and a 'User Info.' section with a 'Sign-out' button. The main content area contains three sections: 'ACCOUNT INFORMATION' with a 'View' button leading to A11, 'MY ORDERS' with a 'View' button leading to A13, and 'MY REVIEWS' with a 'View' button leading to A14.

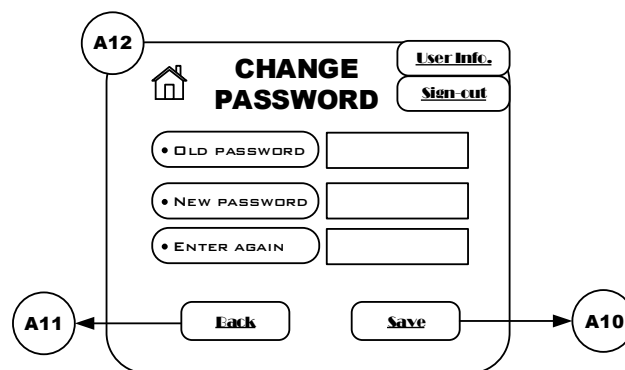
The User information page provides the customer with an interface to view and edit his or her account information as well as the orders and reviews made. The user can choose to click the corresponding “View” button to enter the information of interest.

## A11. Customer Account Information Page

The Customer Account Information Page (A11) features a home icon, a title bar with 'ACCOUNT INFORMATION', and a 'User Info.' section with a 'Sign-out' button. The main content area displays a form for account details: USERNAME (XXXX) with an 'EDIT' button, EMAIL (XXXX@XXXX) with an 'EDIT' button, and PHONE NO. ((XXX)-XXX-XXXX) with an 'EDIT' button and a circular refresh icon. Below the phone number is an 'ADD' button. At the bottom, there is a 'Change Password' button leading to A12.

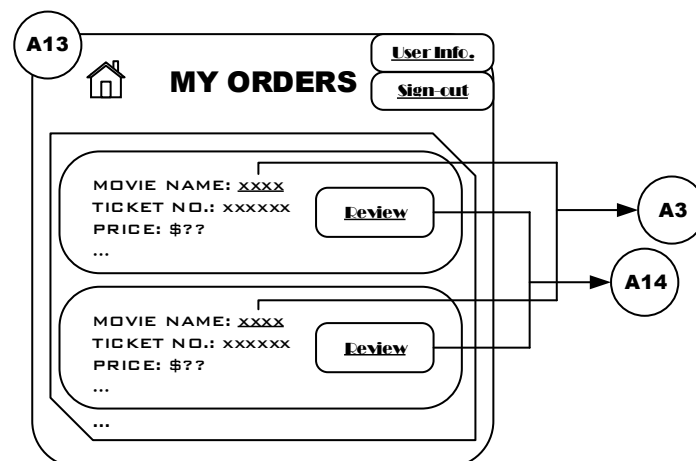
This webpage shows the customer account information including the username, E-mail address along with the optional phone number. By clicking on “Edit”, the relevant attributed can be editable to the user. In addition, the customer can add or delete any phone information by clicking “ADD” or the cross button accordingly. The “Change Password” button directs to “A12. Customer Change Password Page”

## A12. Customer Change Password Page



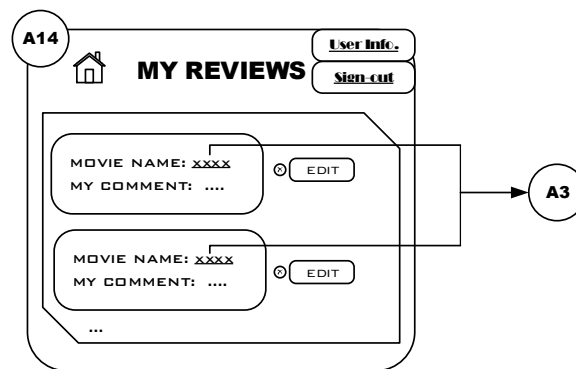
Customers are permitted to change his or her account password in this webpage. When doing this, the user is supposed to provide the current password. Then one needs to input new password and confirm by entering twice. If the action is legal, the password will be changed and then the page will go back to “A11. Customer Account Information Page” after 5 seconds by clicking “Save” button. The “Back” links to the previous webpage.

## A13. My Orders Page



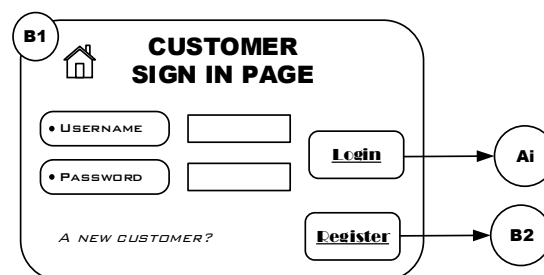
This page provides the customer's history orders information including movie name, ticket number, price and so forth. All the movie names directs to the “A3. Movie Detail Page” with its corresponding movie information. A click of the “review” button proceeds to “A14 My Review Page”.

## A14. My Reviews Page



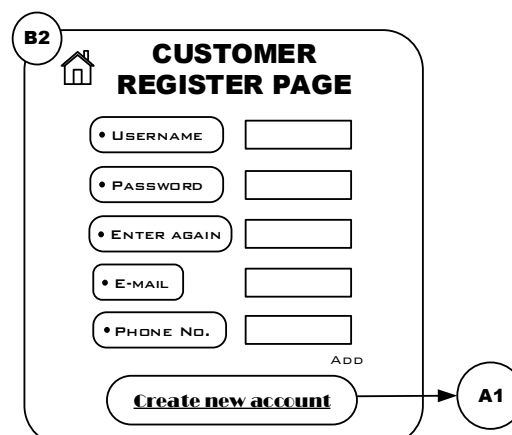
The information of customers' review history is included in this webpage. By clicking the "EDIT" or the cross button, it allows modification and deletion of any review. If directed from "A13. My Orders Page" with a movie without a review, the system automatically opens a new tag for the customers to enter comment for the corresponding movie. Just as in "A13. My Orders Page", all the movie names directs to the "A3. Movie Detail Page" with its corresponding movie information.

## B1. Customer Sign in Page



This page allows the customer to log in as a registered customer, which is required by any webpages involving with purchase a ticket. After entering correct username and password, one is directed to its previous webpage with a current signed-in status by clicking on "Login" button. If "Register" button is clicked, it proceeds to "B2. Customer Registration Page".

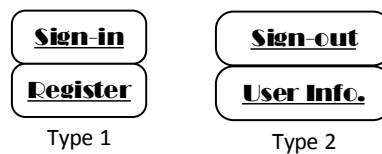
## B2. Customer Sign in Page



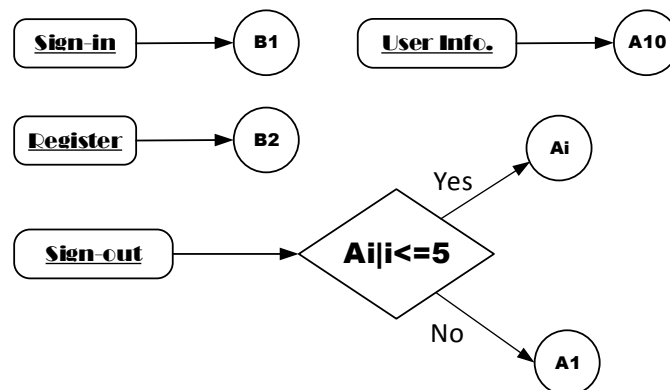
In order to register a customer account, one needs to provide a username and password. Password needs a second entering to confirm its correctness. Another information as E-mail and phone number are optional and the “ADD” bottom is used if one needs to enter more than one phone number. After clicking “Create new account”, the user is directed to “A1 Customer Interface Page.”

### ★ Button Specification I

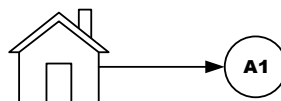
For all the webpages in A Block, there are two types of button sets displaying at the top-right corner of the webpage as follows.



Type 1 button sets are displayed if the customer has not signed in, which only appear in webpages from A1 to A5, otherwise Type 2 button sets will be shown. Through A6 to A14, a status of being signed-in is mandatory; hence the Type 2 sets are at the top-right corner of the webpage.



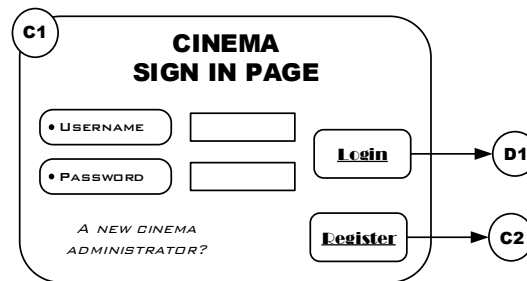
The flow of action is illustrated in the figure below. It is worthy of being mentioned that the webpage from “Sign-out” button directing to depends on the current page index. If the current page is in the range of A1 to A5, it stays but switches the type 2 button to type 1, otherwise it jumps to “A1. Customer Interface Page”.



Any click on the “Home” button in A/B blocks is directed to “A1. Customer Interface Page”.



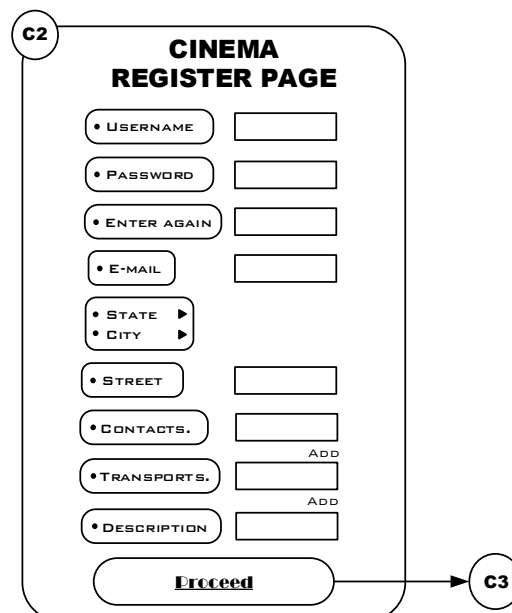
## C1. Cinema Sign in Page



The diagram shows a rounded rectangle representing the 'CINEMA SIGN IN PAGE'. At the top left is a circle labeled 'C1'. The title 'CINEMA SIGN IN PAGE' is centered at the top. Below the title are two input fields: '• USERNAME' and '• PASSWORD'. To the right of these fields are two buttons: 'Login' and 'Register'. An arrow points from the 'Login' button to a circle labeled 'D1'. Another arrow points from the 'Register' button to a circle labeled 'C2'. At the bottom of the page, the text 'A NEW CINEMA ADMINISTRATOR?' is displayed.

In this page, a cinema administrator logs in using his or her username and password and proceeds to “D1. Cinema Interface Page” if clicking “Login”. For a new administrator, “Register” button is offered.

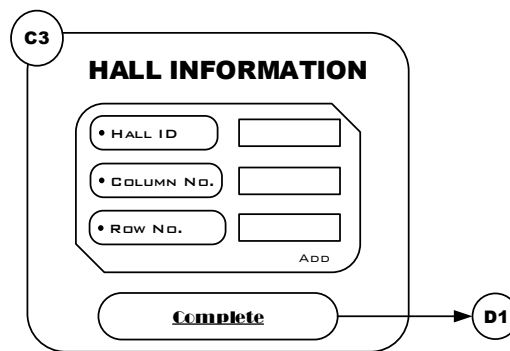
## C2. Cinema Register Page Step I



The diagram shows a rounded rectangle representing the 'CINEMA REGISTER PAGE'. At the top left is a circle labeled 'C2'. The title 'CINEMA REGISTER PAGE' is centered at the top. Below the title are several input fields: '• USERNAME', '• PASSWORD', '• ENTER AGAIN', '• E-MAIL', '• STATE' (with a dropdown arrow), '• CITY' (with a dropdown arrow), '• STREET', '• CONTACTS.', '• TRANSPORTS.', and '• DESCRIPTION'. To the right of the 'CONTACTS.' and 'TRANSPORTS.' fields are small 'ADD' buttons. At the bottom of the page is a large button labeled 'Proceed'. An arrow points from the 'Proceed' button to a circle labeled 'C3'.

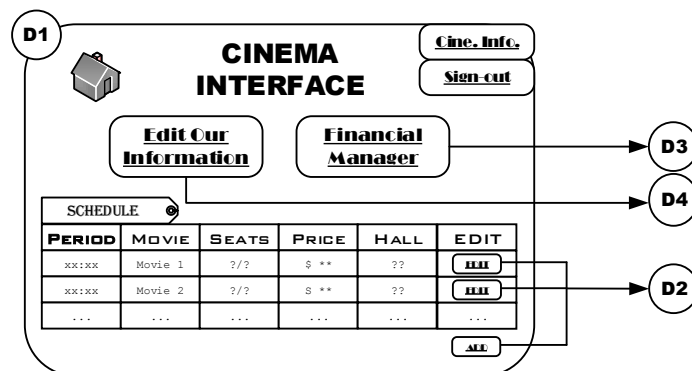
To register a cinema administrator account, the user needs to fill out the basic information required for registering a cinema such as username, password, cinema location, contacts and so on. The “ADD” button can be utilized if one needs to enter more than one contact and transport information. After clicking the proceed button, it jumps to the step II of registering a cinema account.

### C3. Cinema Register Page Step II



This webpage requires the cinema user to enter the information for its projection hall including the Hall ID as well as the number of column and row seats. Again, "ADD" button is available if one wishes to add another hall under its cinema account. Once "Complete" is clicked, the system generates a cinema administrator account for the user and directs to "D1. Cinema Interface Page".

### D1. Cinema Interface Page



This is a homepage of a cinema user, which contains several entrances to editing cinema information, checking financial condition and checking ticket information pages respectively. At the bottom of this page, the movies that are to be on show are displayed in terms of a table, whose attributes includes period, seats, price and hall number. By clicking the "EDIT" or "ADD" button, the administrator is led to "D2. Ticket Management Page" so that the user can modify the current tickets information or arrange new movie sessions.

## D2. Ticket Management Page

**TICKETS MANAGEMENT**

• MOVIE NAME XXXXX

• YEAR XXXX

• PERIOD XX:XX

• HALL NO. XX

• PRICE \$ ??

**screen**

Confirm → D1

In “D2. Tickets Management Page”, depending on whether directed using “EDIT” or “ADD” from “D1. Cinema Interface Page”, the user can choose to input new session information or modify the current information such as movie name, year, period etc. As for the seats information, it allows the cinema administrator to mark or unmark any seat slot to indicate its availability. By “Confirm” the update, it jumps back to “D1. Cinema Interface Page” with a modified or new information in the schedule table.

## D3. Finance Manager Page

**FINANCE MANAGER**

Sorted by: ☐ BOX OFFICE ☐ ATTENDANCE ☐ ...

• MOVIE NAME XXXXX

• HALL NO. XX

• TIME INTERVAL From xx/xxxx To xx/xxxx

Confirm → DISPLAY STATISTICS RESULT

In the present page, several static features are provided for the administrator to gain a better understanding of sales condition of its own cinema. One can select any sorting pattern provided along with any more specific constraints such as movie name or time interval and so on. By “Confirming”, the corresponding results will be displayed in the bottom window. This can help the owner of the cinema to make better decisions on its operation strategies.

## D4. Cinema Information Page

The screenshot shows a web page titled "CINEMA INFORMATION". At the top right, there are two buttons: "Cine. Info." and "Sign-out". Below the title, there is a list of fields for user information, each with an "EDIT" button: USERNAME, E-MAIL, STATE, CITY, STREET, CONTACTS, TRANSPORTS, and DESCRIPTION. At the bottom, there are two buttons: "Hall Information" and "Change Password". A line from the "D4" label points to the top left corner of the page. A line from the "Change Password" button points to the "D6" label. A line from the "Hall Information" button points to the "D5" label.

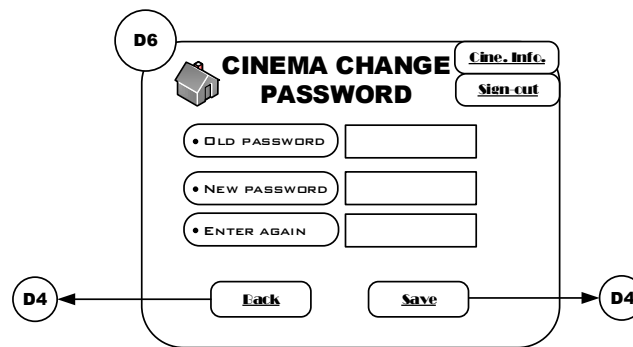
The basic information that a cinema administrator entered during registration are listed in the current webpage. The user can edit and add or delete (if applicable) any of these information by clicking the according button. Two other buttons linking with the relevant webpages are offered if one wishes to check or update hall information and change the password associated with the cinema account.

## D5. Hall Information Page

The screenshot shows a web page titled "HALL INFORMATION". At the top right, there are two buttons: "Cine. Info." and "Sign-out". Below the title, there is a list of fields for hall information, each with an "EDIT" button: HALL ID, COLUMN NO., and ROW NO. At the bottom, there are two buttons: "DELETE" and "ADD". A line from the "D5" label points to the top left corner of the page.

The display of webpage is somehow almost identical to the "C3. Cinema Register Page Step II" which requires the cinema administrator to enter the hall information during registration. However, instead of asking for the information, this webpage lists the hall information that the cinema account ever input for further editing if necessary. With the "ADD" and "DELETE", the user is able to increase or decrease the number of projection hall it owns.

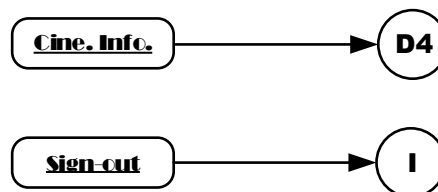
## D6. Cinema Change Password



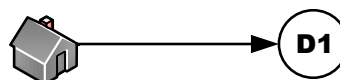
This page permits the cinema users to change his or her account password as the procedure for the customer users. The page will go back to “D4. Cinema Information Page” after 5 seconds by clicking “Save” button.

### ★ Button Specification II

For all the webpages in D Block, the set of buttons “Cine. Info.” and “Sign-out” appears at the top-right corner of the webpage. It is due to the rule that any anonymous account is not allowed for cinema administrator users. The linking pages of these buttons are shown as below.



Any click on the “Home” button in D blocks is directed to “D1. Cinema Interface Page”.



### **Part III Brief Summary**

During this phase period, two aspects of work have been accomplished by our group: the overall *conceptual database design* and the *user interface design*, which provides a detailed framework for our proposed database management system and webpage implementation in later phases.

As for the ER model, customers and cinemas as two basic users are categorized along with other fundamental entity sets such as movies and tickets, in which detailed attributes are carefully considered. Several relationship sets are also analyzed and identified involving with other entities. Furthermore, we also transform the ER diagram into relational schema model in order to further visualize the table structure and enhance the easiness of later implementation.

In terms of User Interface Design, according to their functionalities achieved, webpages are essentially divided into two parts: customer-oriented and cinema-oriented. With regards to customer-oriented webpages, not only it contains the pages for the customer to perform queries upon movie and cinemas, it also offers the functionalities to make rating and reviews on the movie as well as purchase movie tickets from the cinema. As to cinema-oriented webpages, webpages with different benefits to the cinema user are designed to help manage the movie tickets one provides along with check and analyze its financial operation conditions.