



CS353 - DATABASE SYSTEMS

PROJECT FINAL REPORT

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1. Application System Description

Movie Rental System is a software tool that is aimed to help a movie renting business operate. It is an application where customers have accounts, browse through movies, interact with them and other users, and also provides an interface for employees. The said application is a web application connected to a database to operate.

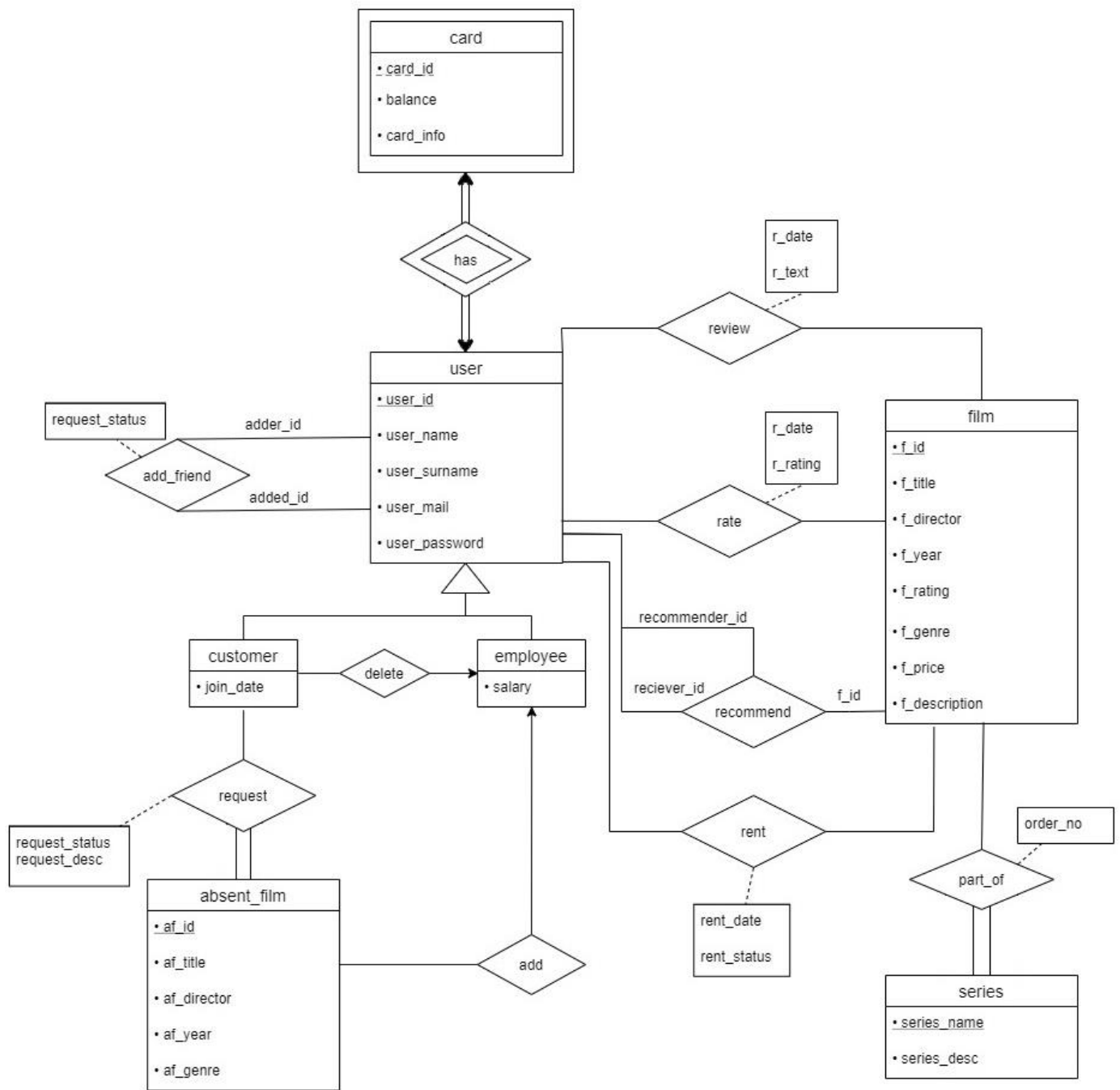
Each user account is stored in the database as a “user”. There are two kinds of users: customer and employee. They differ because they both can browse & interact with films. However, only users can make a request and employees have the authority over users. One can create a user account and sign in at the index page by filling in the form. One can search for other users, add them as friends and accept or decline friend requests. These processes of friendship requests are stored in the database as “add_friend”.

Users can search for a movie, rent it, rate it, and write a review, and recommend it. Other users can see these reviews, ratings and recommendations. When a customer is unable to find a film in the system, they can fill a form to request a film. These films can be part of a series. Users can check their renting history, currently rented films.

Users’ balance information is stored in their cards. When a user tries to rent a movie, their balance information is checked from their cards before proceeding to payment.

Employees can see the list of absent films reported by customers and can add them to the system. Employees also have a panel to manage users. From that panel, employees can delete user accounts by searching the information of the customer to be deleted.

2. Final E/R Diagram



3. Final List of Tables

User

Relational Model:

user(user_id, user_name, user_surname, user_mail, user_password)

Primary Key:

(user_id)

No Foreign Keys

Customer

Relational Model:

customer(user_id, join_date)

Primary Key:

(user_id)

Foreign Key:

user_id to user

Employee

Relational Model:

employee(user_id, salary)

Primary Key:

(user_id)

Foreign Key:

user_id to user

Film

Relational Model:

film(f_id, f_title, f_director, f_year, f_rating, f_genre, f_price, f_desc)

Primary Key:

(f_id)

No Foreign Keys

Absent Film

Relational Model:

absent_film(af_id, af_title, af_director, af_year, af_genre)

Primary Key:

(af_id)

No Foreign Keys

Card

Relational Model:

card(card_id, balance, card_info, user_id)

Primary Key:

(card_id)

Foreign Key:

user_id to user

Add Friend

Relational Model:

add_friend(adder_id, added_id, request_status)

Primary Key:

(adder_id, added_id)

Foreign Keys:

adder_id to user

added_id to user

Request

Relational Model:

request(user_id, af_id, request_status, request_desc)

Primary Key:

(user_id, af_id)

Foreign Keys:

user_id to customer

af_id to absent_film

Review

Relational Model:

review(user_id, f_id, r_date, r_text)

Primary Key:

(user_id, f_id)

Foreign Keys:

user_id to user

f_id to film

Rate

Relational Model:

rate(user_id, f_id, r_date, r_rating)

Primary Key:

(user_id, f_id)

Foreign Keys:

user_id to user

f_id to film

Recommend

Relational Model:

recommend(recommender_id, reciever_id, f_id)

Primary Key:

(recommender_id, reciever_id, f_id)

Foreign Keys:

Recommender_id to user

receiver_id to user

f_id to film

Rent

Relational Model:

rent(user_id, f_id, rent_date, rent_status)

Primary Key:

(user_id, f_id)

Foreign Keys:

user_id to user

f_id to film

Series

Relational Model:

series(series_name, series_desc)

Primary Key:

(series_name)

No Foreign Keys

Part_of

Relational Model:

part_of(f_id, series_name, order_no)

Primary Key:

(f_id, series_name)

Foreign Keys:

f_id to film

series_name to series

4. Implementation

The user-end of the application is implemented for web platforms, using HTML with PHP, which provides front-end functionality and web routing. The UI was not the main focus of the project, it was the database. For this reason, styling was done by HTML style tags together with CSS.

The PHP application was directly connected to and executed queries on the database which is hosted on `dijkstra.ug.bcc.bilkent.edu.tr` using MySQL. We have a separate Java application connected to the database, which we used during implementation for data management purposes together with TablePlus.

To mention some of the problems faced during the making of the project, one of them was to utilize a column of a table, namely `rent(rent_status)`. Our initial thought was to update the status of a rented movie from “Ongoing” to “Expired”, when a set time of 30 days have passed after the renting process. However, it was hard to determine a trigger to update this attribute, since our solutions to decide when to change the attribute were either vague or heavily inefficient. Finally, we ended up deleting the column and resolved the issue by comparing the current date that was derived from the php function `date(“Y-m-d”)` and the rent date on the database (derived from a basic query). If the difference was more than 30 days -which is the fixed amount of time one can rent the movie for- we changed the display according to an “Expired” rental and if otherwise to an “Ongoing” rental.

Another example we faced in this project was connecting a central database for different developers. This was causing a problem when more than one developer was working on the same data for the connection part. To solve this problem, each developer working on the connection part switched to work on their own database. In addition, we used TablePlus software to visualize our tables during development for easier and better understanding of the queries.

Work Distribution

Ali Emre Aydoğmuş: Done database creation through java, wrote search queries and triggers, responsible for php connection to database of `home.php`, `manageFilms.php` some of `manageUsers.php`, administration check.

Mustafa Çağrı Durgut: Worked on movie and series pages. Developed the renting, rating, reviewing and recommending features.

Yekta Seçkin Satır: Done cascading on table creation queries, responsible for php connection to database of some pages, mock data, php connection to database of rentedMovies.php, rentHistory.php and some of home.php.

Yusuf Miraç Uyar: Implemented HTML and PHP pages for the project base. Also connected the friendship, user and film management parts to the database.

5. Advanced Database Features Used

There are three triggers for updating the movie rating in the database. Each time a rating is submitted, updated or deleted; the average of the rating of newly rated movies are recalculated.

There are cascading on almost all tables. If a primary key on a table references another primary key, in the CREATE of the table, there is a ON DELETE CASCADE ON UPDATE CASCADE prompt. This way, if a user is deleted, their reviews, friendships, rent history and such are also deleted.

Additionally, if a primary key does not reference any other primary key, in the CREATE of the table they belong to, they have an additional AUTO_INCREMENT attribute. By utilizing this, when creating a user or a movie or etc, the id of that entity is generated automatically. Also through the following query, we can access the next value to be incremented to use in php:

```
SELECT AUTO_INCREMENT FROM information_schema.TABLES
WHERE TABLE_SCHEMA = 'DB_NAME' AND TABLE_NAME = 'TABLE_NAME'
```

We have two report queries to see weekly and monthly revenue generated by rented films.

```
SELECT sum(F.f_price) as weeklyrevenue
FROM film as F, rent as R
WHERE DATEDIFF( NOW(), R.rent_date ) <= 7 AND F.f_id = R.f_id

SELECT sum(F.f_price) as monthlyrevenue
FROM film as F, rent as R
WHERE DATEDIFF( NOW(), R.rent_date ) <= 30 AND F.f_id = R.f_id
```

Additionally, there is a report that shows the total revenue per day for the last 50 days that any revenue has been generated.

```
SELECT R.rent_date, sum(F.f_price) as monthlyrevenue
FROM film as F, rent as R
WHERE F.f_id = R.f_id GROUP BY R.rent_date
ORDER BY R.rent_date LIMIT 50
```

We have two report queries to see weekly and monthly new users.

```
SELECT count(*) as totalNewCustomersWeekly FROM customer WHERE
DATEDIFF( NOW(), join_date ) <= 7;
```

```
SELECT count(*) as totalNewCustomersMonthly FROM customer WHERE
DATEDIFF( NOW(), join_date ) <= 30;
```

Those queries will generate weekly and monthly reports for new customer statistics.

6. User's Manual

Login Page

A screenshot of a login page with a light beige background. At the top center is the title "Login Page" in a large, bold, dark serif font. Below the title are two input fields: "Email" and "Password", both in a dark serif font. Each label is followed by a white rectangular input box with a thin black border. Below the "Password" field is a grey rectangular button with the word "Login" in a dark serif font. At the bottom of the form are two blue underlined links: "Forgot my_password" and "Don't have an account? Create new one".

Login Page

Email

Password

Login

[Forgot my_password](#)

[Don't have an account? Create new one](#)

In the Index page there is a log in screen. To be granted access, you have to log in by clicking on the login button after having your email and password entered as credentials in the form.

If you forgot your password or do not have an account, you can proceed to according pages using according buttons.

Forgot Password Page

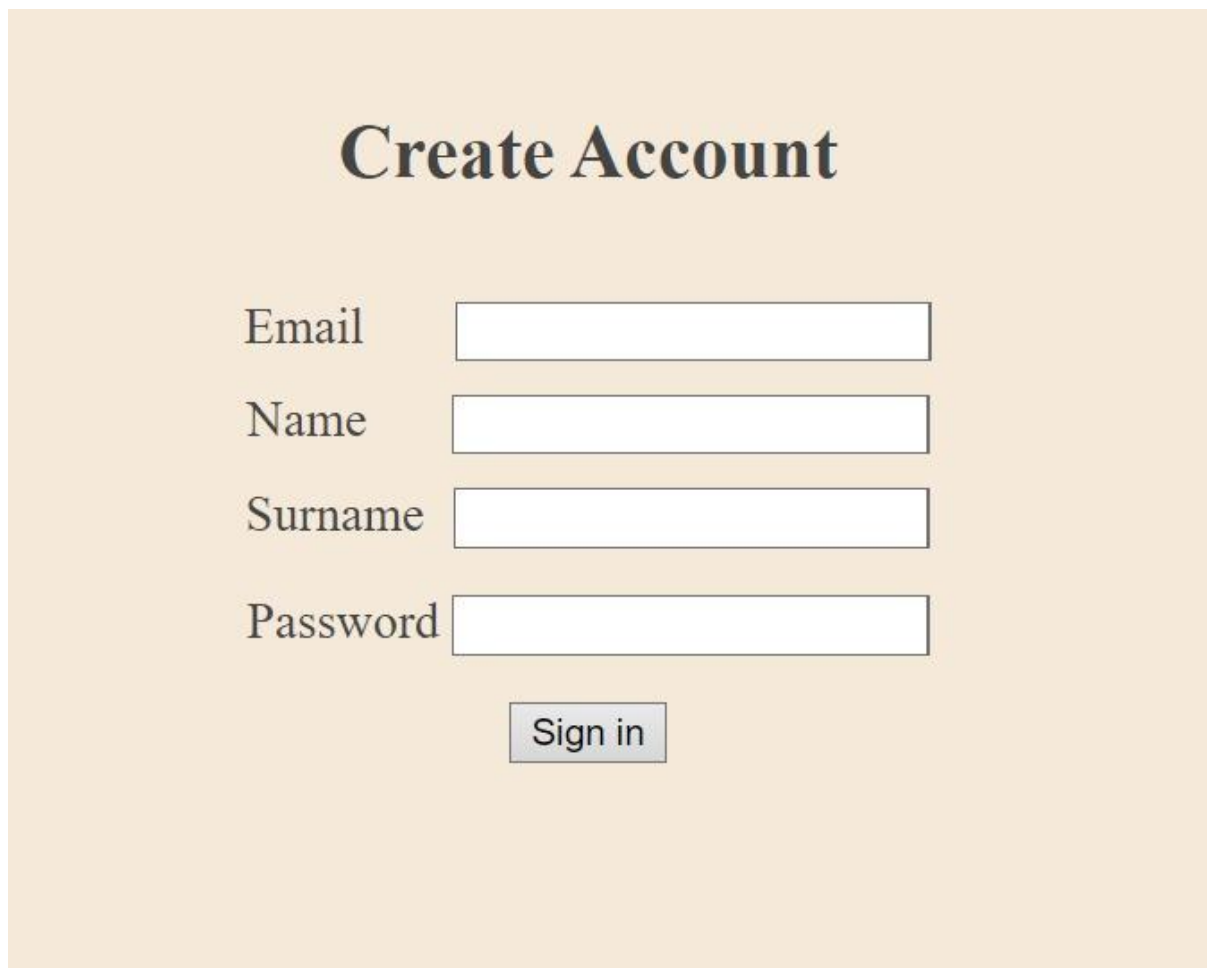
Create new Password

Email

Reset

In the Forgot Password Page, you are asked to enter your email that your account is registered by. The reset button will send the email containing the instructions on how to reset your password.

Create Account Page

A screenshot of a 'Create Account' form. The form is centered on a light beige background. At the top, the title 'Create Account' is displayed in a large, bold, dark serif font. Below the title, there are four input fields, each preceded by a label in a dark serif font: 'Email', 'Name', 'Surname', and 'Password'. Each label is aligned to the left of its corresponding white rectangular input box. Below the 'Password' field, there is a 'Sign in' button with a grey gradient and a thin black border. The button text is in a dark serif font.

Create Account

Email

Name

Surname

Password

In the Create Account Page, you are able to create your account by entering an email, your name, and a password. To do this, you need an email registered to the system.

Left Menu

| |
|-------------------|
| Marco Polo |
| Wallet: 100\$ |
| Home Page |
| Rented Movies |
| Rent History |
| Friends |
| Manage Films |
| Manage Users |
| |

The menu you see on the left displays your name and wallet balance. Using this menu, you can navigate through the application.

If you are not an employee, you cannot view the Manage Films and Manage Users buttons.

Home Page

| | | | | | | | |
|-------------------|--|------------------|--------------|-------------|-------------|-------------|----------------------------|
| Marco Polo | Search Films By: | | | | | | |
| Wallet: 100\$ | <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> | | | | | | |
| Home Page | Films: | | | | | | |
| Rented Movies | Title | Director | Genre | Year | Rate | Cost | |
| Rent History | Number 13 | Alfred Hitchcock | Dram | 1922 | 6.3 | 30\$ | Movie Page |
| Friends | The Pleasure Garden | Alfred Hitchcock | Dram | 1925 | 5.7 | 20\$ | Movie Page |
| Manage Films | The Mountain Eagle | Alfred Hitchcock | Dram | 1926 | 7.4 | 40\$ | Movie Page |
| Manage Users | The Ring | Alfred Hitchcock | Romance | 1927 | 7.3 | 40\$ | Movie Page |
| | Downhill | Alfred Hitchcock | Dram | 1927 | 7.8 | 45\$ | Movie Page |
| | Psycho | Alfred Hitchcock | Horror | 1960 | 8.2 | 50\$ | Movie Page |

Marco Polo

Wallet: 100\$

- Home Page
- Rented Movies
- Rent History
- Friends
- Manage Films
- Manage Users

Search Films By:

No such film exists...

Can't find what you are looking for? Request a new film here:

The Home Page displays the films. You can filter the films to be displayed by search criteria of your choice. You can enter the criteria from the menu displayed at the top of the home screen. Those criteria include minimum rating, maximum rating, minimum price, maximum price. You can also search by typing the fields for the title, director, and genre.

By clicking on the fields that display the films, you can go to the page of that movie. After making your search, if you see the home page as in the second picture, it means that your film does not exist in the system. From that menu, you can send a film request to the system.

Rented Movies Page

Marco Polo

Wallet: 100\$

- Home Page
- Rented Movies
- Rent History
- Friends
- Manage Films
- Manage Users

Search Films By:

Rented Films:

| Title | Director | Genre | Year | Rate | Rent Date | |
|----------|------------------|--------|------|------|------------|----------------------------|
| Downhill | Alfred Hitchcock | Dram | 1927 | 7.8 | 04.07.2022 | Movie Page |
| Psycho | Alfred Hitchcock | Horror | 1960 | 8.2 | 31.06.2022 | Movie Page |

In the Rented Movies Page, you can see the films that you have rented currently, as in the home page. You can filter the films to be displayed by entering the search criteria of your choice. Those criteria include the same ones from the home page.

Rent History Page

| | | | | | | |
|-------------------|--|------------------|--------------|-------------|-------------|---------------------------------------|
| Marco Polo | Search Films By: | | | | | |
| Wallet: 100\$ | <input type="text" value="Title"/> <input type="text" value="Alfred Hitchcock"/> <input type="text" value="Genre"/> <input type="text" value="Year"/> <input type="text" value="MinR"/> <input type="text" value="MaxR"/> <input type="button" value="Q"/> | | | | | |
| Home Page | Rented Films: | | | | | |
| Rented Movies | Title | Director | Genre | Year | Rate | Rent Date |
| Rent History | The Ring | Alfred Hitchcock | Romance | 1927 | 7.3 | 08.03.2020 Movie Page |
| Friends | | | | | | |
| Manage Films | | | | | | |
| Manage Users | | | | | | |
| | | | | | | |

The Rent History Page displays the films that you had rented. The display is similar to the way it is on the home page. The films to be displayed can be filtered by search criteria of your choice. Those criteria include the same ones from the home page.

Movie Viewing Page

| | |
|-------------------|--|
| Marco Polo | Psycho |
| Wallet: 100\$ | Director: Alfred Hitchcock Genre: Horror Year: 1960 Rate: 8.2 |
| Home Page | Description: Psycho is Hitchcock's most widely known film. It centers around a woman named Marion Crane (played by Janet Leigh), who steals \$40,000 from her employer so she can run away with the man she loves and start a new life. |
| Rented Movies | Related Series |
| Rent History | Rent Status: Rent for 50\$ |
| Friends | <input type="button" value="Recommend"/> |
| Manage Films | Rate: |
| Manage Users | <input type="text" value="Add your coment here if you have any..."/> |
| | ★★★★☆ |
| | <input type="button" value="Rate"/> |
| | Yusuf Uyar |
| | Not gonna lie, they had me in the first half. A well made thriller, always keeping the audience guessing as to what's going to happen. Well made, well acted, and wonderfully dark vibes. |
| | Rate: 4.0 |
| | Cagri Durgut |
| | Rate: 4.0 |
| | Ali Emre |
| | I like the bit where he looks out the window and sees the haunted house on the hill |
| | Rate: 3.5 |
| | Seckin Satir |
| | Rate: 4.5 |

Marco Polo

Wallet: 100\$

Home Page

Rented Movies

Rent History

Friends

Manage Films

Manage Users

Psycho

Director: Alfred Hitchcock Genre: Horror Year: 1960 Rate: 8.2

Description: Psycho is Hitchcock's most widely known film. It centers around a woman named Marion Crane (played by Janet Leigh), who steals \$40,000 from her employer so she can run away with the man she loves and start a new life.

[Related Series](#)

Rent Status: Already Rented

Recommend

Rate:

Add your coment here if you have any...

★ ★ ★ ★ ☆

Rate

Yusuf Uyar

Not gonna lie, they had me in the first half. A well made thriller, always keeping the audience guessing as to what's going to happen. Well made, well acted, and wonderfully dark vibes.

Rate: 4.0

Cagri Durgut

I like the bit where he looks out the window and sees the haunted house on the hill.

Rate: 3.5

Ali Emre

I like the bit where he looks out the window and sees the haunted house on the hill.

Rate: 3.5

Seckin Satir

I like the bit where he looks out the window and sees the haunted house on the hill.

Rate: 4.5

Clicking on a movie will take you to the Movie Viewing Page assigned to that movie. On this page; you can see the basic information about the movie, comments made by other users about the movie, and information about if you have rented the movie is displayed. If you have not rated, a rent button with the price of the film will be displayed. If you click the button that reads “Related Series”, you will get to the series page of the series that the movie belongs to, if it does belong.

The fixed rental period for a movie is 30 days, meaning each movie is rented by the user for 30 days, always.

There is a menu for you to make your own comments and ratings about the film. With the recommend button, you can recommend the film to your friends.



Seeing this pop-up means that you do not have enough money to rent the movie you are trying to rent. To rent a movie you need to have enough money in your wallet. You can check this by comparing the according values displayed in the left menu and the movie page.

Select Friends to recomend

- ☒ Yusuf Uyar
- ☐ Ali Emre
- ☒ Cagri Durgut
- ☐ Seckin Satir

If you click the recommend button, this pop-up menu is displayed. You have to select your friend to recommend from the list, then click the recommend button.

Series

Marco Polo

Wallet: 100\$

Home Page

Rented Movies

Rent History

Friends

Manage Films

Manage Users

Psycho

Description: Psycho is an American horror franchise consisting of six films loosely based on the Psycho novels by Robert Bloch: Psycho, Psycho II, Psycho III, Bates Motel, Psycho IV: The Beginning, the 1998 remake of the original film, and additional merchandise spanning various media.

Rented Films:

| Title | Director | Genre | Year | Rate | Cost | |
|------------|------------------|--------|------|------|------|----------------------------|
| Psycho | Alfred Hitchcock | Horror | 1960 | 8.2 | 50\$ | Movie Page |
| Psycho II | Richard Franklin | Horror | 1983 | 7.3 | 50\$ | Movie Page |
| Psycho III | Alfred Hitchcock | Horror | 1986 | 6.7 | 50\$ | Movie Page |

The Series Page displays the description of the series and a list of the movies it is related to, in a similar fashion to the film lists in other pages.

Friends

Marco Polo

Wallet: 100\$

Home Page

Rented Movies

Rent History

Friends

Manage Films

Manage Users

Friends

| Name | Surname | Email | |
|------------|---------|--------------------------------|--------------------------------|
| Cagri | Durgut | cagri.durgut@ug.bilkent.edu.tr | Recomendations |
| Seckin | Satir | seckin.satir@ug.bilkent.edu.tr | Recomendations |
| Add Friend | | See all recommendations | Friend Requests |

Your friends are listed in the Friends Page.

The buttons next to that information links to the recommendations that your friend made. The button that reads “See all recommendations” links to the list of the recommendations made by all of your friends.

There are buttons that read “Add Friend” and “Friend Requests”. Those buttons link to those pages accordingly.

Friend Requests

| Marco Polo | Search Requests: | | | |
|------------|---|----------|---------------------------------|--|
| | Name Surname Email <input type="button" value="Q"/> | | | |
| | Requests: | | | |
| | Name | Surname | Email | |
| | Emre | Aydogmus | emre.aydogmus@ug.bilkent.edu.tr | Accept Request Decline Request |
| | | | | |
| | | | | |
| | | | | |

The Friend Requests Page displays the list of people who have sent you a friend request. You can filter by using name, surname, or email as a search key.

You can accept the friend request by clicking the button that says “Accept Request”, reject the request by clicking the button that says “Decline Request”.

Add Friend

| | |
|-------------------|---|
| Marco Polo | Add Friends: |
| Wallet: 100\$ | <input type="text" value="Name"/> <input type="text" value="Uyar"/> <input type="text" value="Email"/> <input type="button" value="Q"/> |
| Home Page | Search Resault: |
| Rented Movies | |
| Rent History | |
| Friends | |
| Manage Films | |
| Manage Users | |
| | |

| Name | Surname | Email | |
|-------|---------|-------------------------|------------------------------|
| Yusuf | Uyar | Yusufuyar2000@gmail.com | Send Request |

You can search for a friend using name, surname, or email on the Add Friend Page. Results of your search are displayed as a list of users. From the button to the right, you can send a friendship request to that user.

Recommendation Page

| | | | | | | | |
|-------------------|--|------------------|--------------|-------------|-------------|-------------|----------------------------|
| Marco Polo | Recomended Films by Cagri Durgut: | | | | | | |
| Wallet: 100\$ | Title | Director | Genre | Year | Rate | Cost | |
| Home Page | Psycho | Alfred Hitchcock | Horror | 1998 | 8.2 | 50\$ | Movie Page |
| Rented Movies | | | | | | | |
| Rent History | | | | | | | |
| Friends | | | | | | | |
| Manage Films | | | | | | | |
| Manage Users | | | | | | | |
| | | | | | | | |

In the Recommendation Page from a specific friend, you can see a list of recommendations that the friend made.

Recommendation From Friends

| | | | | | | | |
|---|---------------------------------------|------------------|--------------|-------------|-------------|-------------|----------------------------|
| Marco Polo Wallet: 100\$ Home Page Rented Movies Rent History Friends Manage Films Manage Users | Recomended Films from Friends: | | | | | | |
| | Title | Director | Genre | Year | Rate | Cost | |
| | Psycho | Alfred Hitchcock | Horror | 1998 | 8.2 | 50\$ | Movie Page |
| | The Mountain Eagle | Alfred Hitchcock | Dram | 1926 | 7.4 | 40\$ | Movie Page |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

In the Recommendation Page from all friends, you can see a list of recommendations that were made by all of your friends.

Manage Films

| | | | | | | | | | | | | |
|--|---|-------|----------|-------|--------|------|--------|-------------|--|--|--|--|
| Marco Polo Wallet: 100\$ Home Page Rented Movies Rent History Friends Manage Films Manage Users | Add film | | | | | | | | | | | |
| | <table><tr><td>Title</td><td>Director</td><td>Genre</td><td>Year</td><td>Cost</td><td>Series</td></tr><tr><td colspan="6">Description</td></tr></table> | Title | Director | Genre | Year | Cost | Series | Description | | | | |
| Title | Director | Genre | Year | Cost | Series | | | | | | | |
| Description | | | | | | | | | | | | |
| Add | | | | | | | | | | | | |
| <hr/> | | | | | | | | | | | | |
| Requests | | | | | | | | | | | | |
| Yusuf Uyar | | | | | | | | | | | | |
| Title: Ice Age 3 Director: Carlos Saldanha Genre: Comedy Year: 2009 | | | | | | | | | | | | |
| Coment: Realy good film. Please add | | | | | | | | | | | | |
| Delete Request | | | | | | | | | | | | |
| <hr/> | | | | | | | | | | | | |
| Cagri Durgut | | | | | | | | | | | | |
| Title: 3 Idiots Director: Rajkumar Hirani Genre: Comedy Year: 2009 | | | | | | | | | | | | |
| Delete Request | | | | | | | | | | | | |
| <hr/> | | | | | | | | | | | | |

If you are an employee, you can view the Manage Films Page. Here, a list of film requests made by users are displayed. You can delete requests by the Delete Request button. With the menu above, you can add films by entering required fields: Title, Director, Genre, and Year, and optionally non-required fields: Series, Description.

Series Description

Description

Create

When you add a movie whose series do not already exist in the database, this pop-up will prompt you to enter a description for the series.

Manage Users

Jane Doe

Wallet: \$99.99

Home Page

Rented Movies

Rent History

Friends

Manage Films

Manage Users

Log Out

Add User

Email

Name

Surname

Password

Add

Search User:

Name

Surname

Email

Q

Search Resault:

| Name | Surname | Email | |
|---------|----------|---------------------|-------------|
| Mary | Sue | ms@gmail.com | Delete User |
| Melih | Ucer | mu@gmail.com | Delete User |
| Oguzcan | Pantalon | kirbydoge@gmail.com | Delete User |

If you are an employee, you can view the Manage Users Page. Here, you can search for a user using name, surname or email. From the button to the right of a list entry, you can delete a user.

In addition, by providing the information needed, you can create new customer accounts for the website.

Statistics

| | | |
|-----------------|------------------------------|----------------|
| Jane Doe | Statistics | |
| Wallet: \$99.99 | Weekly Revenue | |
| Home Page | \$7.99 | |
| Rented Movies | | |
| Rent History | Monthly Revenue | |
| Friends | \$33.97 | |
| Manage Films | | |
| Manage Users | Weekly New Customers | |
| Statistics | 1 new customer | |
| Log Out | | |
| | Monthly New Customers | |
| | 2 new customer people | |
| | Daily Revenue | |
| | Date | Revenue |
| | 2022-04-20 | \$25.98 |
| | 2022-05-16 | \$7.99 |

If you are an employee, you can view the Statistics Page. Here, you can see your weekly and monthly revenue as well as weekly and monthly new customers for the current week and month. Additionally, you can see the revenue generated per day, for the last 50 days that any revenue has been generated.

Project Web Page

OnlineMovieRentalSystem.github.io