MYBNB

CSCC43: Introduction to Databases

Database Design Project

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Github Link : https://github.com/BaharChidem/MyBnBProject.git

Purpose:

We were tasked with constructing a database to facilitate the functioning of an online housing marketplace, similar to the famous home rental service, Airbnb. This platform acts as a virtual hub for a variety of lodging and rental options. Users can sign up either as a guest or as a host, allowing them to either browse and reserve rentals from the various listings on the site, or to advertise their own listings for potential guests.

The platform offers a range of features tailored to both guests and hosts. Guests have the capability to search and refine the available listings, reserve a chosen listing, monitor and adjust their reservations, as well as leave feedback on both the listings and the hosts. Hosts, on the other hand, have the functionality to create and adjust their listings, set and alter their listing availabilities, monitor and modify their reservations, and offer reviews on guests who have rented from them.

A range of reporting options have been implemented permitting users to view a detailed report on total number of reservations in a given date range, the most used noun phrase for a particular listing and much more.

Conceptual Problems Encountered

1. Storing Hosts vs Guests

   When we were working on implementing the system, we really wanted to keep things simple and easy for our users, most of whom are either guests or hosts. So, we had to find a balance between offering different options and actions while still making it user-friendly. After a lot of thought, we decided to go with role differentiation in the database and the system. So, when users sign up, they can explicitly choose if they want to be a guest or a host. We also made it possible for hosts to use the guest functionality only after they sign up as a guest. We know that some hosts might want to try out the guest experience too, so we didn't want to limit them.

   When hosts decide to sign up as guests or vice versa, it won't create a whole new user account. We just add the additional role to their existing account. That way, they can easily switch back and forth between roles without any hassle. Our main aim was to make the system as intuitive and user-friendly as possible.

2. Filtering the Search Results for more accurate and desired results

   When we started to work on accommodating several filters while searching for listings, we had to think of a solution that considered all possible combinations of selections when the user searched for a specific result after choosing the various options to search for a listing (i.e. After search by postal code they could filter that search result according to the date range, availability and price). We wanted to do filtering in the database We tried building a query incrementally to accommodate the search. As a user selected filter was difficult to maintain. So, we decided to use database views instead, each filter would create a new view, and the next filter would then work on that view. This resulted in a chain of views with the result produced. It was simpler and more efficient.

3. Maintenance of Deletion of Data

   When we started to think about how to manage the deletion of listings and users. We had to think through it in detail. As this information that we stored could be of vital importance. We did not want to completely lose the information once the user deletes their account or delete a listing. To handle this, we came up with the solution of having an indicator/ Flag that stores the status of the user account and the listing. So, whenever the user deleted their account, it would be flagged as inactive and the user won't be able to login unless they reactivate their account. For the Listings only the hosts can delete them, and they are also flagged as inactive on the database. This way it is easy to know which account/listing is deleted and the data is not lost and maintained effectively.

4. Managing the various amenities that a listing can offer

   When creating a system for managing listings, we faced an interesting challenge - how to effectively categorize and store the different amenities available in each listing. We needed a solution that could handle multiple categories of amenities, as well as the ability to link each of these amenities to specific listings. We initially thought about storing all this information directly within the listing table itself. However, this approach soon turned out to be quite unmanageable, leading to redundancies and complexities when trying to query or update the category names of amenities. To solve this, Our solution was to divide the data across three distinct areas: one for categorizing the amenities, another for detailing the individual amenities themselves, and a third for linking amenities to their respective listings. This division ensured a clean, manageable structure. We avoided data redundancy and improved the overall efficiency of our system.

ASSUMPTIONS MADE

1) Guests can only access guest account options unless they also sign up as a host. When a guest signs up as a host with the same email they used for their guest account, no new user is created in the database.

2) Hosts can only access host account options unless they also sign up as a guest. When a host signs up as a guest with the same email they used as a host, no new user is created in the database.

3)Guests have only one payment info stored we store the credit card information.

4) Each user's email address is unique.

5) Postal code should have at least 3 characters at minimum.

6) A Guest can leave multiple reviews for a host that they've rented from.

7) A Host can leave multiple reviews for a guest that they've hosted.

8) Both text-based comment and a numeric rating are required for any review.

9) A Guest can leave only one review for each of their past reservation and this review can be edited.

10)Every Listing has 1 address associated with it.

11)A Reservation belongs to one guest and is for one listing.

12)Every listing should have at least one amenity (At least one essential amenity).

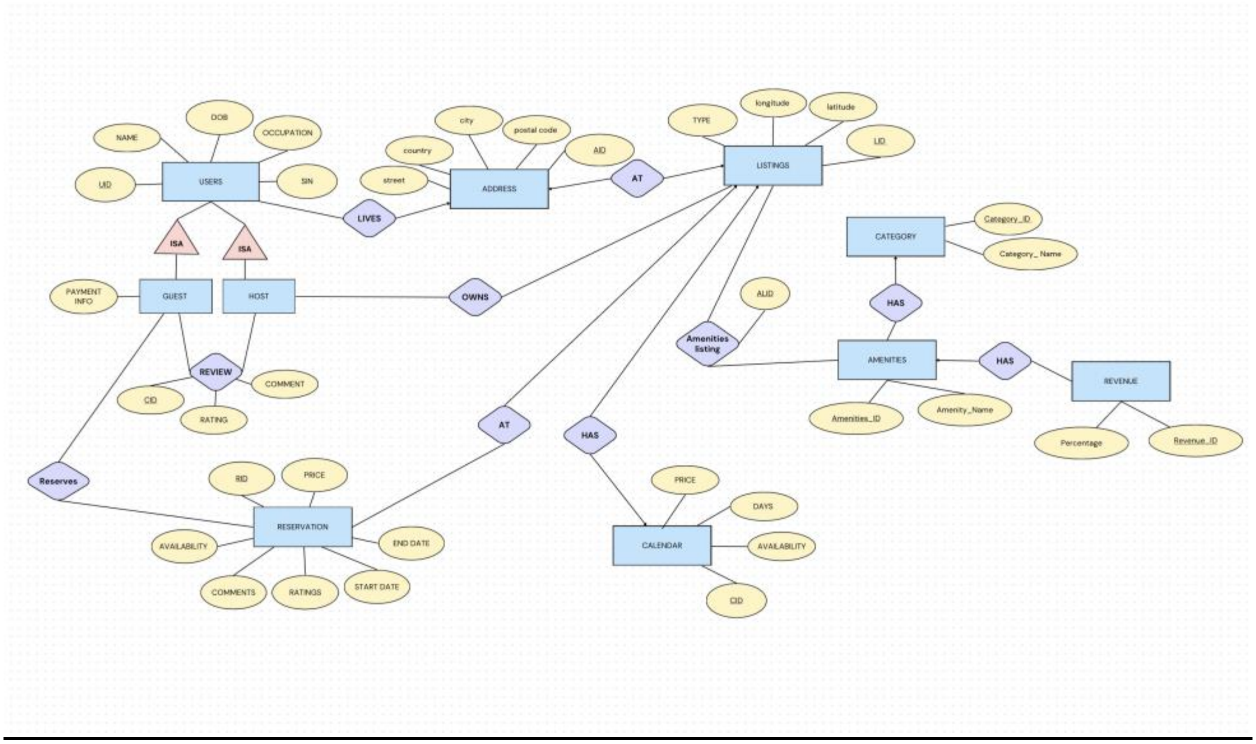
13) Once the guest cancels their reservation, The reserved dates become [Open] on the calendar.

14) Once the host deletes their account, All the listings on their account becomes inactive all the reservation related to those listings become blocked on the calendar.

15) The date range filter searches for listings that have availability for that exact date range.

16) For make a reservation feature, we display the listings which have at least one availability in the date range that the guest entered.

ER DIAGRAM



RELATIONAL SCHEMA

1) Users (<u>UID</u>, AID, SIN, Email, Name, DoB, Occupation, Password, Account)

*AID is a foreign key

2) Address (<u>AID</u>, Street, City, Country, Postal_code)

3) Guests (<u>UID</u>, payment_info)

*UID is a foreign key

4) Hosts (UID)

*UID is a foreign key

5) Listings (<u>LID</u>, AID, UID, Type, Longitude, Latitude, Status)

*UID is a foreign key

*AID is a foreign key

6) Calendar (<u>CID</u> , LID, Date, Price, Availability)

*LID is a foreign key

7) Reservation (RID, LID , UID, Price, Availability, StartDate, EndDate,CanceledBy, Rating, Comment)

*UID is a foreign key

*LID is a foreign key

8) Category (Category_ID , Category_Name)

9) Amenities (Amenities_ID , Category_ID, Amenity_Name)

*Category_ID is a Foreign Key

*Amenities_ID is a Foreign Key

10) AmenitiesListing (ALID , LID, Amenities_ID)

*LID is a Foreign Key

* Amenities_ID is a Foreign Key

11) Review (CID, Reviewer, Reviewee, Rating, Comment)

*Reviewer(UID) is a foreign key ,Reviewee(UID) is a foreign key.

12) Revenue (Revenue_ID , Amenity_Name, Percentage)

*Amenity_Name is a foreign key

Note:

Guests(UID), Hosts(UID) are subsets of Users(UID)

Users(AID), Listings(AID) are subsets of Addresses(AID)

Listings(UID) is a subset of Hosts(UID)

Reservation (UID) is a subset of Guests(UID)

Review(Reviewer), Review(Reviewee) are subsets of Users(UID)

Calendar(LID) is a subset of Listings(LID)

Amenities(Category_ID) is a subset of Category(Category_ID)

AmenitiesListing(LID) subset of Listings(LID)

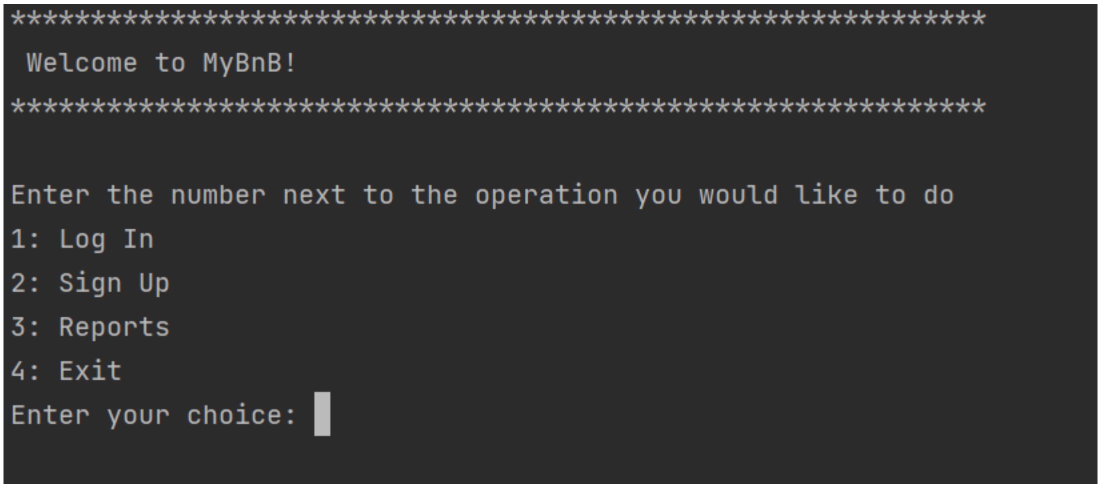
AmenitiesListing(Amenities_ID) subset of Amenites(Amenities_ID)

USER MANUAL

Our project utilizes a command-line interface. To get started, first, you need to compile the Java project and proceed to execute Main.java.

Upon launching the application, you'll encounter a menu with a variety of choices for you to explore. Each option on this menu is associated with a distinct number, serving as its identifier.

To select, all you have to do is input the number corresponding to your desired option. This user-friendly feature enables quick and seamless navigation through our database system.



```
*************************************************************
 Welcome to MyBnB!
*************************************************************


Enter the number next to the operation you would like to do
1: Log In
2: Sign Up
3: Reports
4: Exit
Enter your choice: 
```

On initiating the program, you will be greeted by a menu displaying a variety of options, each corresponding to a unique numerical identifier. To select, please input the number tied to your desired option. There are certain operations in the program that may require additional user information. In such cases, you will be prompted with a question, alongside the valid responses placed in parentheses next to the question. This is to guide your input and enhance your user experience.

When it comes to selecting a listing (for the purpose of adding availability as a host or to reserve as a guest), Reservation (to cancel future reservations or to leave feedback on a past reservation), or a user (to leave a review), you will need to input the corresponding number shown on the screen. Dates in our application should be entered in the YYYY-MM-DD format. When providing date ranges, please ensure they are inclusive.

Prices and geographical coordinates in our application should be input as data type 'double'. When defining price ranges, they must be inclusive, with the minimum price entered first, followed by the maximum price.

For coordinates, please adhere to the valid range within which the coordinates can range from specified in parentheses.

Ratings, on the other hand, are integer-based, with a valid range of 0-5 (inclusive), which will also be presented in parentheses for your reference.

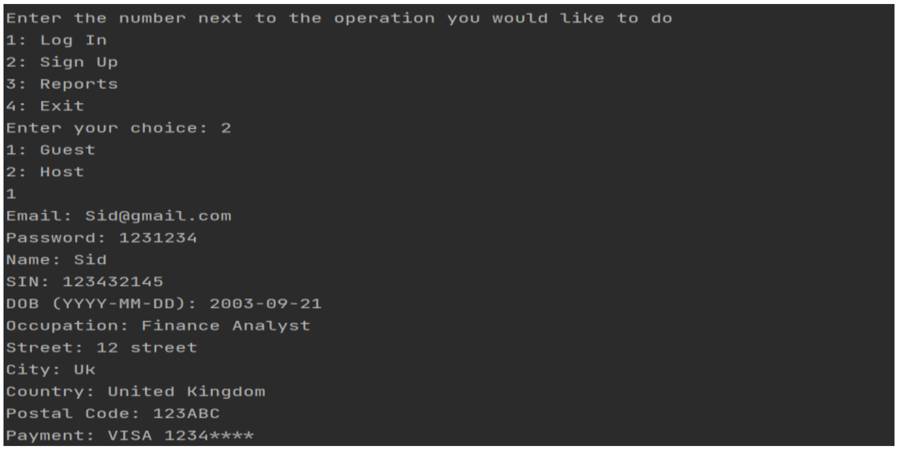
Finally, when writing reviews, feel free to use spaces and any number of characters. However, please refrain from using new line characters.

For fields like email, password, credit card number, Social Insurance Number (SIN), and postal code, ensure that there are no spaces within the entered values.

The Process to use the application:

A) SIGNING UP onto MyBNB

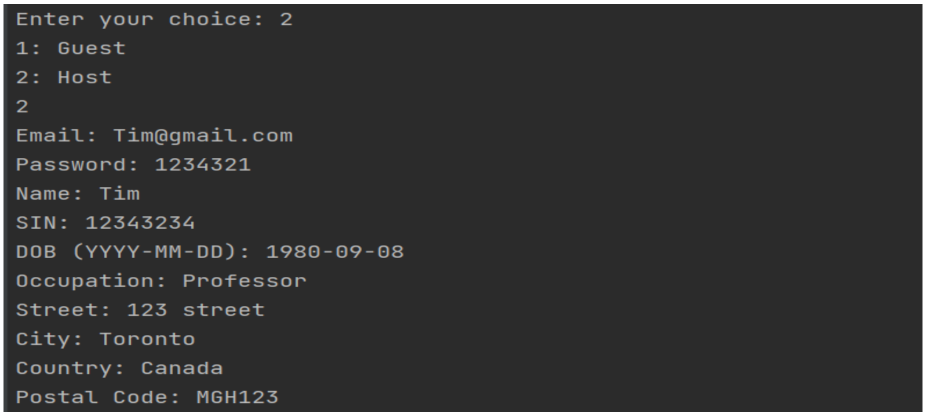
The user is given two options of signup either as a host or a guest. The user cannot sign up as both at the same time. But they can become a guest/host by signing up again with the same email id and password. After this they can use the account to access both the guest/host options.



```
Enter the number next to the operation you would like to do
1: Log In
2: Sign Up
3: Reports
4: Exit
Enter your choice: 2
1: Guest
2: Host
1
Email: Sid@gmail.com
Password: 1231234
Name: Sid
SIN: 123432145
DOB (YYYY-MM-DD): 2003-09-21
Occupation: Finance Analyst
Street: 12 street
City: Uk
Country: United Kingdom
Postal Code: 123ABC
Payment: VISA 1234****
```

The above example is how a user can signup themselves to the service as a guest.

The below example is how a user can sign up as a host.

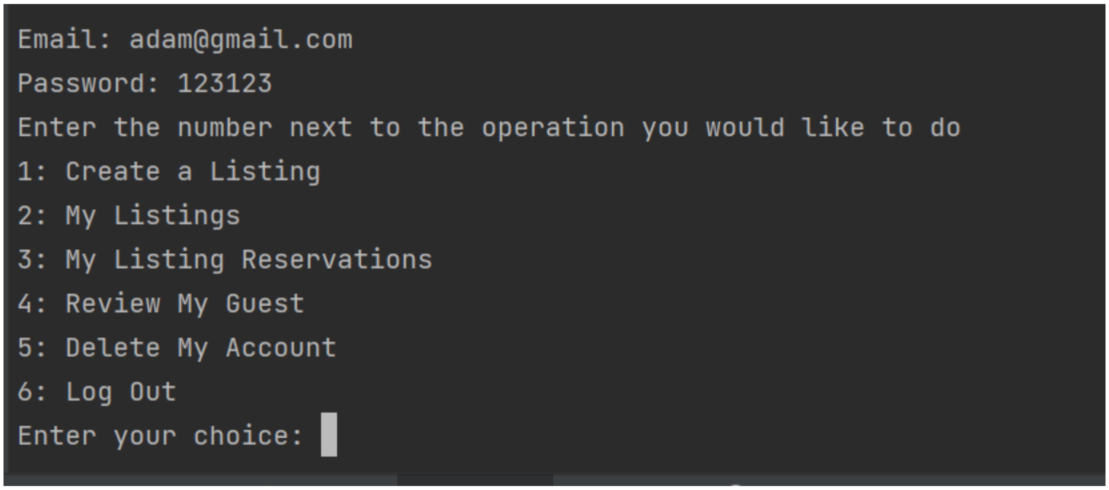


```
Enter your choice: 2
1: Guest
2: Host
2
Email: Tim@gmail.com
Password: 1234321
Name: Tim
SIN: 12343234
DOB (YYYY-MM-DD): 1980-09-08
Occupation: Professor
Street: 123 street
City: Toronto
Country: Canada
Postal Code: MGH123
```

B) LOGGING IN

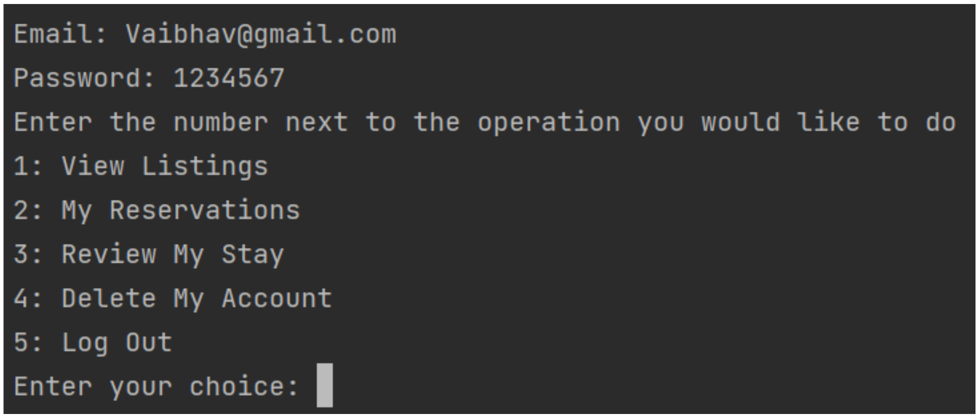
Users have the option to choose to login as either host or guest. Logging into their account will lead them to the various guest/host options that are offered. For hosts features like creating a listing, viewing their listings, the reservations they have and so much more. The application will display whether the login was successful or unsuccessful if the user tries to login with invalid credentials.

The below example shows the page that shows up when a host login to their account successfully.



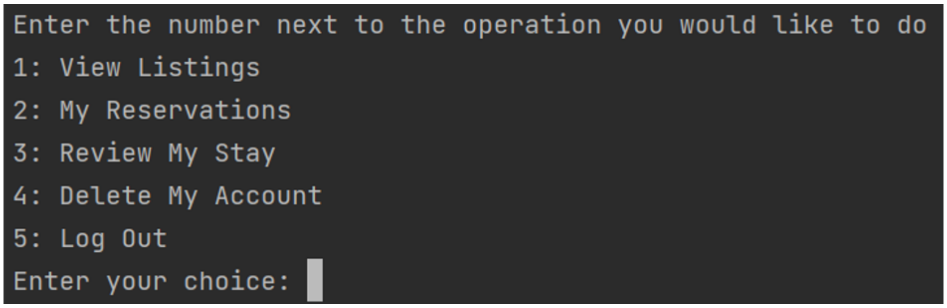
```
Email: adam@gmail.com
Password: 123123
Enter the number next to the operation you would like to do
1: Create a Listing
2: My Listings
3: My Listing Reservations
4: Review My Guest
5: Delete My Account
6: Log Out
Enter your choice: 
```

The below example shows the login page that shows up when guest logins to their account successfully.



```
Email: Vaibhav@gmail.com
Password: 1234567
Enter the number next to the operation you would like to do
1: View Listings
2: My Reservations
3: Review My Stay
4: Delete My Account
5: Log Out
Enter your choice: 
```

C) The Various Options that a Guest can use



```
Enter the number next to the operation you would like to do
1: View Listings
2: My Reservations
3: Review My Stay
4: Delete My Account
5: Log Out
Enter your choice: 
```

1)View Listings

This option will allow the user to search for listings according to their preferences.

The user is provided with three options to search listings.

1)Search by Latitude and Longitude allows the user to search listings with a specific longitude and latitude. They can also search within a specific range of distance or default distance (within 5km) of the latitude and longitude they entered.

2) Search by Postal code allows the user to search a listing with a postal code. This option looks for adjacent postal code listings too.

3) Search by address lets the user to search for a listing in a given address.

In addition to this the user gets to filter their search results,

The user gets to filter by date range, price range and by amenities in every search option provided. Finally, after the search the user is given the option to make a reservation.

Make a Reservation

The user is asked to enter the date range again and then we check the database to see the dates are available in that range for reservation if not, we ask the user to enter a new range of dates. Once the reservation is made the user is displayed with the total price for the reservation.

2) My Reservations

This option lets the user to go through their upcoming reservations, past reservation and cancellation that they have made.

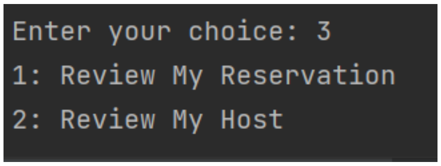
1)Upcoming Reservations gives the user the option to cancel the reservation if they want to.

2) Past Reservation shows the user all their old reservations.

3) Canceled Reservation shows the user all their cancellations.

3) Review My Stay

This option lets the guest to review their host and the listing at which they had a recent stay. The guest can review the listings and the host separately. They also get to rate the experience.



```
Enter your choice: 3
1: Review My Reservation
2: Review My Host
```

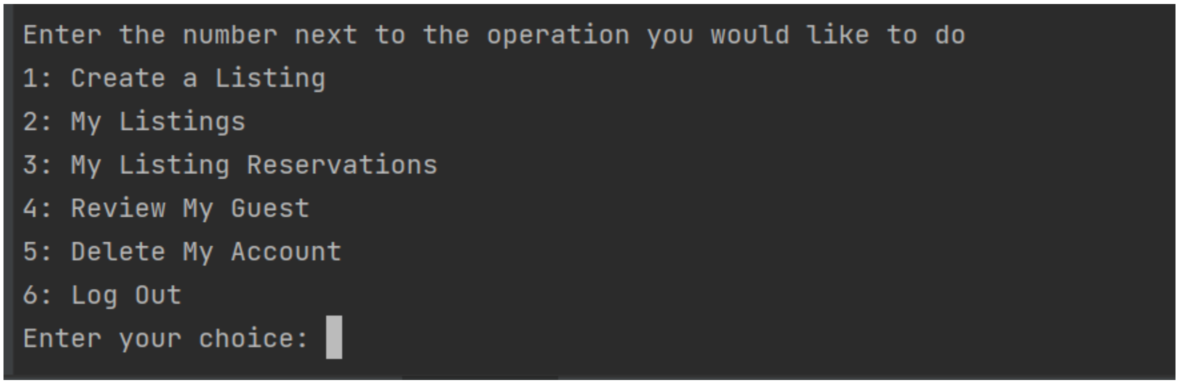
4) Delete My Account

This option lets the guest to delete their account and all their upcoming reservations gets cancelled and the user’s account is flagged as inactive in our system. They can reactivate their account by entering the same username and password.

5) Log Out

Allows the user to logout of the system.

D)The Various Options Hosts can utilize on the system.



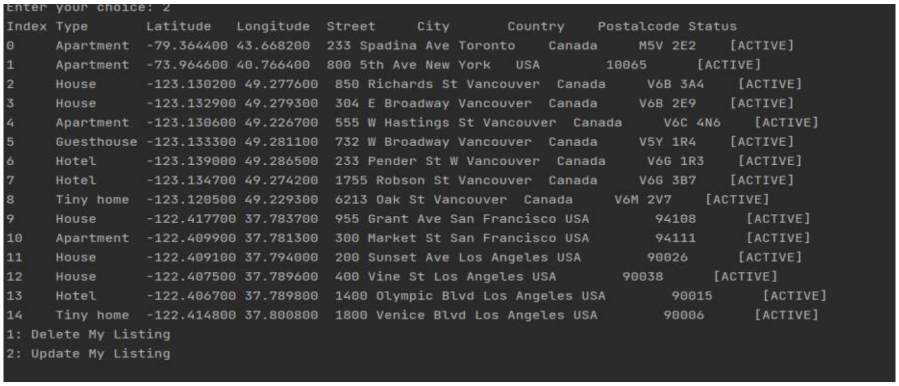
```
Enter the number next to the operation you would like to do
1: Create a Listing
2: My Listings
3: My Listing Reservations
4: Review My Guest
5: Delete My Account
6: Log Out
Enter your choice: 
```

1)Create a Listing

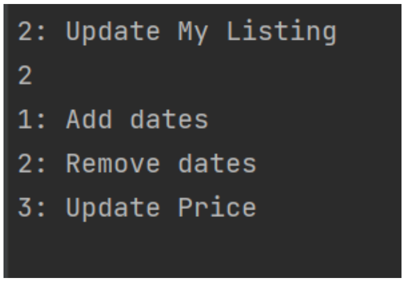
Allows the hosts to post a new listing on the system. The host is made to enter the detail about the Listing. After getting the vital details of the Listing. The host is made to add amenities. At least one of the amenities from essentials needs to be added, after the amenities are added the host can get recommended price for their listing using the host tool kit. They are also given the option to use the host tool kit to choose the amenities to see the increase in their anticipated revenue. Finally, the host is asked to choose if they want to see the anticipated revenue that they will get after adding all the amenities.

2) My Listings

This option allows the host to view all their listings. They are given two choices 1) to delete their listing, 2) update their listing. The update listing option has a submenu from which the user can select one of the three options provided (1) add more dates, 2) remove dates,3) update price). The user has to input the index value of the listing that they would like to update/delete.



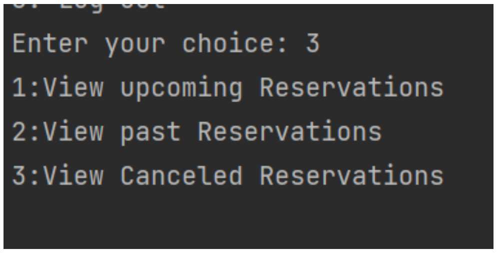
```
Enter your choice: 2
Index Type       Latitude   Longitude  Street     City       Country    Postalcode Status
0     Apartment  -79.364400 43.668200  233 Spadina Ave Toronto    Canada     M5V 2E2    [ACTIVE]
1     Apartment  -73.964600 40.766400  800 5th Ave New York   USA        10065      [ACTIVE]
2     House      -123.130200 49.277600  850 Richards St Vancouver  Canada     V6B 3A4    [ACTIVE]
3     House      -123.132900 49.279300  304 E Broadway Vancouver  Canada     V6B 2E9    [ACTIVE]
4     Apartment  -123.130600 49.226700  555 W Hastings St Vancouver  Canada     V6C 4N6    [ACTIVE]
5     Guesthouse -123.133300 49.281100  732 W Broadway Vancouver  Canada     V5Y 1R4    [ACTIVE]
6     Hotel      -123.139000 49.286500  233 Pender St W Vancouver  Canada     V6G 1R3    [ACTIVE]
7     Hotel      -123.134700 49.274200  1755 Robson St Vancouver  Canada     V6G 3B7    [ACTIVE]
8     Tiny home  -123.120500 49.229300  6213 Oak St Vancouver  Canada     V6M 2V7    [ACTIVE]
9     House      -122.417700 37.783700  955 Grant Ave San Francisco USA        94108      [ACTIVE]
10    Apartment  -122.409900 37.781300  300 Market St San Francisco USA        94111      [ACTIVE]
11    House      -122.409100 37.794000  200 Sunset Ave Los Angeles USA        90026      [ACTIVE]
12    House      -122.407500 37.789600  400 Vine St Los Angeles USA        90038      [ACTIVE]
13    Hotel      -122.406700 37.789800  1400 Olympic Blvd Los Angeles USA        90015      [ACTIVE]
14    Tiny home  -122.414800 37.800800  1800 Venice Blvd Los Angeles USA        90006      [ACTIVE]
1: Delete My Listing
2: Update My Listing
```



```
2: Update My Listing
2
1: Add dates
2: Remove dates
3: Update Price
```

3) My Listings Reservation

This option allows the host to go through the reservations that has been made at their listing.



```
6: Log out
Enter your choice: 3
1:View upcoming Reservations
2:View past Reservations
3:View Canceled Reservations
```

These options are provided to the host to view their reservations according to their preference. The listings are displayed in a table format. In the upcoming reservation option, the host is given the choice to cancel a reservation.

4) Review My Guest

This feature allows the host to review their guest with a rating and comment.

5) Delete Account

This option deletes the hosts account by marking the account as inactive and also removes all their associated listings by marking them inactive on the database and cancelling all upcoming reservations.

6) Logging out

The host can log out of their account.

System Limitations

1) The system lacks a robust front-end that could enhance user experience and provide a more intuitive interface.
2) The host tool kit feature of finding the nearest landmark works for only a certain number of places.
3) If a user sign up as both a host and a guest and then decides to deactivate their account, both of their roles (host and guest) will be deactivated simultaneously. However, if the user chooses to reactivate their account at a later time, both roles will be activated as well.
4) It's important to note that once a listing has been deleted, it cannot be added again. So, if a host deactivates their account and later reactivates it, they will need to create new listings from scratch.
5) When utilizing the price filter for search results, the current implementation automatically organizes the listings according to the price range specified by the user, without displaying the individual prices upfront.
6) The system lacks comprehensive error handling and thorough input sanitization.

Improvements

1) The system would benefit from a more developed front-end that could enhance user experience and provide a more intuitive interface.
2) To make the system better at finding nearby landmarks, we can add more places and locations to its database. We can do this by connecting the system to reliable external sources that provide a lot of information about different places and where they are located on the map. By doing this, the system will have a bigger collection of landmarks to work with, and it will be able to find nearby places more accurately.
3) During signup, users choose their role (host or guest). They can add the other role later in their account settings. Users can deactivate one role while keeping the other active, e.g., pause hosting but continue as a guest.
   When reactivating, users can choose to activate only one role if both were deactivated. Offer user-friendly account management for easy role toggling and status viewing.
4) Provide hosts with the ability to reactivate listings. When a host reactivates their account, they can choose to restore specific listings back to the active listings list.
5) When users use the price filter to search for listings, instead of just showing the listings in the chosen price range without mentioning their actual prices, display the actual prices of each listing to give a more detailed result to the user.
6) More intensive error handling and sanitization can be implemented.

HOST TOOL KIT

The "Host Toolkit" is a feature designed to assist hosts in determining the optimal price for their listings. The system provides personalized pricing suggestions, ensuring hosts set competitive rates while maximizing their potential earnings. Moreover, the toolkit offers valuable recommendations for attractive amenities that hosts can add to their listings, enhancing the guest experience and increasing booking appeal. The system calculates the potential profit, giving hosts valuable insights to make informed decisions and succeed in their hosting ventures.

THE ALGORITHM FOR RECOMMENDATION OF PRICE

The algorithm aims to recommend the price for a newly created listing by gradually refining its criteria to find comparable listings. It begins by searching for listings with the same type, matching amenities, and located in the exact country, city, and postal code as the new listing. If no suitable matches are found, the algorithm progressively relaxes its requirements, starting with the amenity criteria and then the location criteria, until it discovers at least one listing that meets the conditions. The recommended price is then set as the average price of these matched listings. Moreover, it also takes into consideration the proximity to well-known landmarks within the city, adjusting the price accordingly for properties situated near such landmarks. However, if no comparable listings are found at any stage, the algorithm refrains from providing a price recommendation due to insufficient data.

JUSTIFICATION

Location is paramount when setting a price for a listing. Our primary approach is to look at similar properties nearby. Beyond just location, the amenities offered and the type of property (be it a hotel or a house) play a significant role in our pricing strategy. If we can't find a direct match in the vicinity, our preference leans towards comparing a hotel listing to another hotel, even if it's in a different city, rather than comparing it to a house in the immediate area. This approach ensures we're always comparing similar type of listings, ensuring consistent and accurate pricing.

IMPROVEMENTS

To make the system better at finding nearby landmarks, we can add more places and locations to its database. We can do this by connecting the system to reliable external sources that provide a lot of information about different places and where they are located on the map. By doing this, the system will have a bigger collection of landmarks to work with, and it will be able to find nearby places more accurately.

THE ALGORITHM FOR RECOMMENDATION OF AMENITIES WITH ANTICIPATED REVENUE

Our system is designed to help hosts boost their income by recommending key amenities they might be missing. We compare each host's offerings to our comprehensive list of sought-after amenities. By showcasing the average price of listings that include these standout features versus those that don't, we offer a clear perspective on potential earnings by displaying the percentage increase in their revenue. The amenities that are suggested are ranked by the popularity of those amenities. We then display the potential price increase should the host decide to incorporate our suggestions. Furthermore, to give hosts a detailed view, we also present the average number of days similar listings are reserved for, enabling them to make informed decisions about the additions they can make to their listing.

JUSTIFICATION

This method offers a data-driven way to understand the impact of standout amenities on the pricing of listings. By comparing listings with and without these standout features, we can observe the added value these amenities bring. This approach offers hosts an informed perspective on how these amenities influence pricing and thus their potential return on investment. Additionally, understanding the relation between standout amenities and listing prices helps hosts prioritize which features to add, thereby strategically enhancing their properties. By demonstrating the potential price increase, this methodology serves as an effective tool for hosts aiming to optimize their income while ensuring their offerings remain attractive and competitive in the market.

IMPROVEMENTS

Enhancing the platform's database to accommodate a broader range of amenities and seasonal geographical data can greatly improve the accuracy of suggested amenities. The algorithm will consider each host's property and amenities preferences in relation with seasonal factors, providing tailored and relevant suggestions to attract potential guests. By incorporating guest feedback of the listing and amenities, the tool can eventually fine-tune these recommendations, ensuring a seamless and effective process for hosts to showcase their properties with locally popular amenities that align with seasonal interests, ultimately attracting more guests and enhancing the overall income of the host.