

Smart Online System for Renting Properties and Matching Roommates Through Real-Time Conversations and Intelligent Recommendations

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ABSTRACT

Locating an affordable place in most urban areas can be difficult. In most cases, normal web-based solutions only list available properties and do not offer any effective means of communication or support to identify the right roommates. This paper describes the development of a smart website which supports the identification of places to live, communication, and AI-powered recommendations. This application has two main users: tenants and hosts. Tenants seek housing opportunities, whereas hosts list the houses which they would like to let out. Hosts can list their property quickly, whereas tenants search for rooms based on their preferences. Real-time chat functionality using the WebSocket protocol is one of the features implemented in the proposed system to facilitate communication between different users. To ensure that the proposed website offers some intelligence, an AI-based recommendation module is included. Additionally, an intelligent roommate matching module is included. In this case, tenants and hosts will have the opportunity to explore profiles of possible mates using a swipe-based interface. Users can indicate whether they like someone or not in real time and matches will be made if there is mutual interest. An additional feature of this application is an advanced intelligent roommate matching engine based on an algorithm. In this module, several parameters, including but not limited to budget, interests, daily activities, sleeping habits, and other personal factors are taken into account. An overall match score is generated and explained to the users along with the reasons why the algorithm made a particular decision. Finally, this application comes with an AI-powered chat module which takes natural language input (query) from users. The application will return suggestions based on users' budget and preferences related to the housing needs. Notifications for new messages and bookings will be sent in real time. As far as security is concerned, token-based authentication will be implemented. The website will operate on desktop and mobile platforms. Thus, this solution is intended to improve the conventional rental process through introduction of new technologies, including real-time communication, artificial intelligence algorithms, and intelligent design principles.

Keywords: Room Rental System, Roommate Matching, Swipe-based UI, Real-Time Messaging, WebSocket Protocol, AI-Recommendation, Smart Matching System, NLP Query System, Token Authentication, Notification System, Smart Housing Platform.

I. INTRODUCTION

Finding a place to live in the city is getting really tough because many people are looking for rooms to rent. This makes it hard for people to find a place to live and roommates that they get along with. Most of the time the websites we use to find rooms have a lot of limitations. They do not let us chat with people in time or give us suggestions based on what we are looking for. They also do not

help us find roommates that're a good match for us. So we end up spending a lot of time looking for a place to live. The new system we are talking about will make things easier. It will let us search for rooms chat with people and get recommendations all in one place. This will make it easier, for people looking for a place to live to talk to property owners. Rental rooms will be easier to find. We will be able to find roommates

in a more interactive way. The system will help us find roommates by matching us with people that have interests and preferences. This will make finding a place to live.

II. RELATED WORK

A variety of online portals and scientific literature have examined the idea of making property rental and accommodation finding easier. Popular rental portals, such as Airbnb and Zillow, offer extensive listings of property options that can be sorted according to various filters related to location, cost, and additional features. Though the systems work well in terms of property discovery, they are mostly oriented at listings and booking processes while lacking interactivity and personalized features. Recommendation systems were considered for improving user's experience within housing portal systems. Such systems analyse user's preferences and use machine learning techniques to generate appropriate recommendations. However, they still lack interactivity as well as other elements that could improve their effectiveness significantly. Some applications have tried to solve the problem of roommate matching through the use of profile filters and compatibility matching. However, these types of applications are mostly independent applications, where there is no comprehensive approach to integrate property rentals and roommate matching. Additionally, many of these existing applications lack engaging interfaces like swiping matches, which have been proven to improve engagement. Real-time communication has also been investigated in web-based applications using Web-Sockets and socket-based frameworks. They enable real-time messaging, providing a better experience for the users. However, they are not integrated in most rental or housing applications. From the study of various current systems, it is clear that there is a lack of a single platform which can provide all the facilities like listing properties, communicating instantly, recommending suitable properties, and suggesting

suitable roommates in one place. The proposed system will overcome all these shortcomings by incorporating all these functionalities in its design.

III. EXISTING SYSTEM

In the current rental housing solutions mainly comprise of web portals that mainly offer listing and booking facilities. Such web portals provide property owners with an opportunity to advertise their property, whereas renters can search for properties to rent using various filters like location, cost, and features. Despite the convenience brought by existing solutions, there are several limitations with respect to the current solutions. One of the limitations of existing solutions is that most of these solutions lack communication capabilities that enable users to communicate in real-time. The process of searching for a place to rent requires the use of other means of communication since the portal does not support communication functionalities, such as chat. Also, the existing solutions offer little personalized experience since most of them lack intelligent algorithms used to provide recommendations to users. Other notable limitations of the current solutions include lack of roommate matching features and interactive capabilities. Current solutions fail to integrate functions that enable users to find compatible roommates. Moreover, current rental housing solutions lack features that improve the interactive nature of the website and encourage interaction among users. The security and alerting tools present in some applications have not been developed enough, which raises issues in terms of confidentiality of data and late alerts on significant processes such as request for accommodation or even messages. All in all, the current systems are not able to satisfy the requirements of new-generation customers in terms of interaction and integration.

Limitations

- No real-time communication between tenants and hosts
- Limited personalization in property recommendations

- Absence of integrated roommate matching
- Fragmented experience (multiple platforms needed)
- Delayed notifications and updates
- Basic security mechanisms

IV. PROPOSED SYSTEM

It is worth noting that the proposed system is a modern, smart internet system, which will help streamline the whole process of renting out property and finding roommates. This platform will incorporate technologies like real-time communication, recommender algorithms, and other technologies in order to provide users with an easy experience. Moreover, the suggested project will have no need in additional libraries or third-party applications because the architecture is simple. In order to start the process, a user needs to register and log in as a tenant or a host of his/her choosing. Depending on the role assigned, he/she will be provided with an adequate dashboard. Tenants will be able to find suitable places by applying several filters such as budget or preferred location. On their part, hosts will be able to publish new property offers. Communication is carried out using a real-time messaging service which uses WebSocket protocol. All of the exchanged messages are saved on a database, which ensures the safety of information. Another important aspect of the system under discussion is a recommender algorithm. It provides personalized offers depending on a set of factors, as well as a swipe-based roommate matching option. Token-based authentication is utilized to authenticate user requests in order to make sure that the system remains secure. The system will have a notification system that will notify users of new messages and bookings made by them. The system architecture can be scaled depending on its use, either in web or mobile applications.

1. User Authentication Module

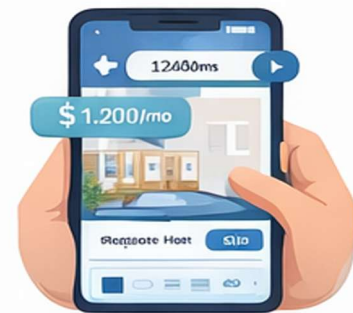


Secure login with JWT token

Fig 1: User Authentication Module

This module is responsible for user registration and log-in capabilities. This module checks the validity of the user's identity and grants access through token-based authentication. This module restricts access only to authorized users.

2. Tenant Module



Search, view and chat

Fig 2: Tenant Module

This module enables the tenant to:

- Search and filter properties
- View property information
- Communicate with hosts using chat

The tenant module enhances the user experience by facilitating the discovery of properties.

3. Host Module



Manage property listings

Fig 3: Host Module

The host module is used by hosts in order to:

- Add properties
- Upload images and other information about the property
- Manage requests for booking

It provides full control of property management.

4. Instant Messaging System



Fig 4: Instant Messaging System

The messaging system helps users communicate instantly using Web-Sockets, which ensures real-time exchange of messages.

5. Recommendation System



Fig 5: Recommendation System

This system takes into account the interests of the user in order to provide suitable property options to them. It saves time for the user and provides accurate results.

6. Roommate Matching System



Swipe-based roommate matching

Fig 6: Roommate Matching System

This system enables users to select their potential roommate using the swipe method. If there is mutual interest between two users, then they can chat with each other.

7. Notification System



Fig 7: Notification System

The notification system notifies users of:

- New messages
- Booking requests
- Updates

This helps users to stay updated.

8. Database System



Fig 8: Database System

The database system contains:

- User information
- Properties listed
- Messages

- Bookings

This makes sure that information is efficiently managed.

9. Security Implementation (JWT Authentication)



Fig 9: Security Implementation (JWT Authentication)

JSON Web Token (JWT) is used for securing the API calls. It checks whether the user is authenticated and authorized.

10. AI Chat Assistant Module



Fig 10: AI Chat Assistant Module

It is a feature that provides an intelligent assistant to help users interact through natural language. It gives instant results and enhances user experience. Helps in saving time from manually searching for suggestions

11. AI Roommate Compatibility Matching Module



Fig 11: AI Roommate Compatibility Matching Module

The AI Roommate Compatibility Matching module improves the existing roommate matching module by integrating smart analysis techniques. Compatibility is measured through:

- Budget
- Lifestyle behaviours (sleeping, hygiene, smoking)
- Hobbies

Scores a match percentage (for example, 92%)
Lists reasons for compatibility (similar hobbies, budget)

12. Swipe-Based (Card-Based) Matching Interface



Fig 12: Swipe-Based (Card-Based) Matching Interface

The module offers an interactive interface that enables users to easily match roommates. Display of users' profiles as cards.

V. Results and Discussion Status:

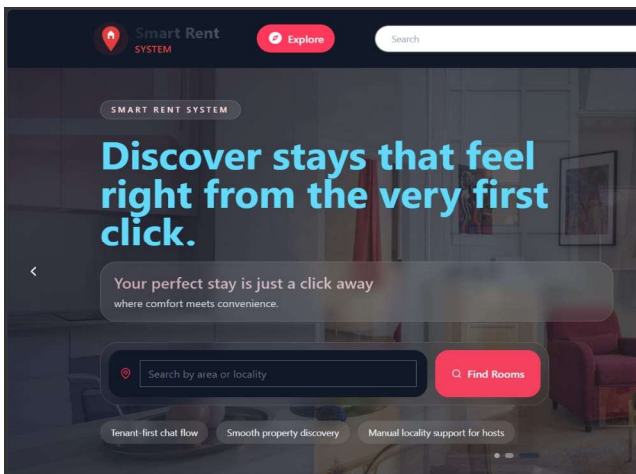


Fig 10: OUTPUT SCREEN

In addition to developing the system, we were able to test its performance and usability. The system provides efficient support for both the tenants and hosts through providing them with an easy way to browse and manage their properties. The modules for the tenant and host worked properly, enabling efficient browsing and managing of properties. Moreover, the use of web sockets in real-time chat system allowed for instant messaging and saving messages in the database. The recommendation system suggested appropriate properties to the user, whereas the roommate match module made it possible to connect the right roommate. Finally, the real-time notifications were provided, while the use of JSON Web Token (JWT) secured the user's access to the system.

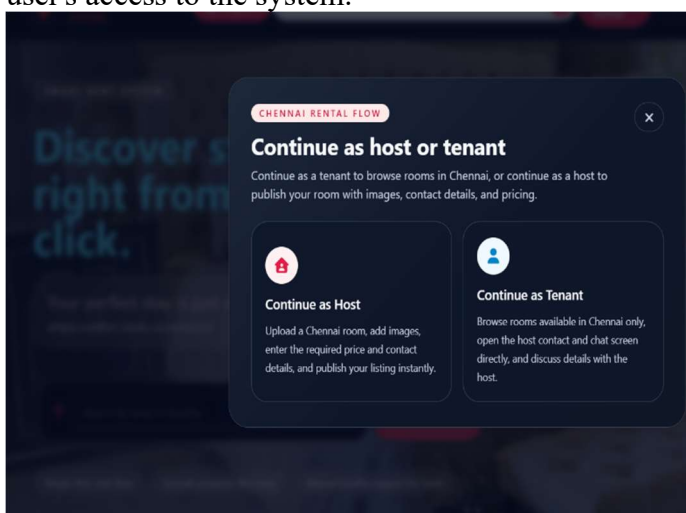


Fig 10: Website Result

The developed web application is friendly and responsive. The dashboards have been well-organized to facilitate easy navigation during property searching, managing the listings, chatting, and receiving notifications. This interface ensures that the software is viable and applicable in its practical context.

VI. Conclusion and Future Work

The presented design is an efficient solution for developing a smart and integrated application for renting flats and finding roommates. Such crucial functionalities as property listing, communication, and authentication were used in order to provide a better experience for users. The platform allows tenants and hosts to communicate efficiently using WebSocket-based chat, while the recommendation module enables searching for appropriate property according to their interests. Furthermore, it is possible to enhance the capabilities of the app with advanced AI functionalities including an AI chat assistant and a roommate-matching functionality with the use of compatibility analysis. A swipe-based interface may be added to the list of functionalities available within the app, making it more engaging and attractive for users. In addition, notifications may help to make the app more efficient and the use of JWT ensures its secure functioning. In the course of further development, it would be possible to add more advanced ML models in order to make recommendations more accurate. It is also reasonable to implement additional functions, namely online payments, property maps, and mobile app development. Other functionalities that may be developed in order to make the application more intelligent include user verification, ratings, reviews, and fraud detection.

VII. Future Scope

The suggested system could be further improved via introduction of various additional elements and technologies which would increase the accuracy and usability of the suggested system. In particular, in future it might be interesting to

design more advanced algorithms for suggesting appropriate property as well as analyzing potential roommate based on AI techniques. The system can be further extended with addition of the payment functionality which would allow to conduct all transactions related to bookings directly within the system in a secure manner. Map-based visualizations of properties and its surroundings will become possible due to use of the location services. Mobile application can also be introduced. In order to increase security, user identity verification via ID/KYC methods, introduction of rating/review mechanism, and fraud prevention modules can be incorporated. Multilingual interface is one of the other features that can be added into the system. Moreover, various analytical modules for hosting property will become possible to introduce. It is also worth mentioning about some other features which can significantly increase efficiency and interaction with the system, in particular implementation of chatbot technology for answering questions from users, voice search as well as recommendations updates.

Architectures,” Doctoral Dissertation, University of California, Irvine, 2000.

[7] OWASP Foundation, “OWASP Top 10: The Ten Most Critical Web Application Security Risks,” 2021.

[8] M. Fowler, *Patterns of Enterprise Application Architecture*, Addison-Wesley, 2002.

[9] A. B. M. Shawkat Ali et al., “A Smart Real Estate System Using Web-Based Technologies,” *International Journal of Computer Applications*, vol. 182, no. 44, pp. 1–6, 2019.

[10] J. Dean and S. Ghemawat, “MapReduce: Simplified Data Processing on Large Clusters,” *Communications of the ACM*, vol. 51, no. 1, pp. 107–113, 2008.

[11] K. C. Laudon and J. P. Laudon, *Management Information Systems: Managing the Digital Firm*, Pearson, 2018.

[12] Firebase, “Cloud Messaging Documentation,” Google, 2023.

[13] T. Berners-Lee, “Information Management: A Proposal,” CERN, 1989.

VIII. REFERENCE

[1] G. Adomavicius and A. Tuzhilin, “Toward the Next Generation of Recommender Systems: A Survey of the State-of-the-Art and Possible Extensions,” *IEEE Transactions on Knowledge and Data Engineering*, vol. 17, no. 6, pp. 734–749, 2005.

[2] P. Resnick and H. R. Varian, “Recommender Systems,” *Communications of the ACM*, vol. 40, no. 3, pp. 56–58, 1997.

[3] I. Fette and A. Melnikov, “The WebSocket Protocol,” *IETF RFC 6455*, 2011.

[4] D. Tilkov and S. Vinoski, “Node.js: Using JavaScript to Build High-Performance Network Programs,” *IEEE Internet Computing*, vol. 14, no. 6, pp. 80–83, 2010.

[5] M. Grinberg, *Flask Web Development: Developing Web Applications with Python*, 2nd ed., O’Reilly Media, 2018.

[6] R. Fielding, “Architectural Styles and the Design of Network-Based Software

[14] S. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach*, Pearson, 2021.

[15] C. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006.