My First Document

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Abstract

This objective of this paper is to present a new android application software(app) designed to facilitate the process of renting out homes. The app is titled 'To-let' .The problem that this app aims to solve is the difficulty and inefficiency of the traditional process of renting a home in Bangladesh. In the traditional process the renters have to spend a lot of time to search for a house to rent. The landlords also face problems in finding a trusted tenant. Most of the time time the landlords fail to get required information for security purposes from the tenants. The app allows users to list their homes for rent and browse listings in their desired location. It also displays the location of available homes on a map and provides a list of options within a certain radius. The necessary information about the houses, renters and landlords is included in the app. These informations can be easily looked up from within the app. The app aims to make the process of finding and renting a home more efficient and convenient for both renters and landlords. Further research could be conducted to assess the long-term impact and potential for expansion of the app in the rental market.

Keywords

Android, Firebase, GoogleMaps, House renting, Appplication Software

1 Introduction

In the context of the housing market, renters are individuals or families who do not own their own home and are looking to rent a property from a landlord. Renters typically pay a monthly fee to the landlord in exchange for the use of the property.Landlords are individuals or companies who own a property and rent it out to renters. Landlords are responsible for maintaining the property and collecting rent from the renters.

The process of finding and renting a home can be a daunting and time-consuming task in Bangladesh, particularly in highly competitive rental markets. Renters may struggle to locate available homes in their desired location and budget, while landlords may have difficulty finding reliable and trustworthy tenants. In Bangladesh, the renters, have to search their area of interest on foot for any house rental advertisements. Sometimes, the renters even have to go from house to house to inquire if any house if up for rent. This can lead to frustration and stress for both parties, and may

discourage some individuals from entering the rental market altogether. Sometimes some houses with good deals miss the spotlight for their poor geographical location leading those houses to out of competition in the market. In an effort to address this problem in Bangladesh, 'To-let' has been developed to facilitate the process of finding and renting a home.

The problem of finding and renting a home is an important and timely issue, as housing is a basic necessity for individuals and families. In many parts of the world, the demand for rental housing far exceeds the supply, leading to high competition and prices. This can make it difficult for renters to find affordable and suitable homes, and may even force some individuals into homelessness. For landlords, finding reliable and trustworthy tenants can also be a challenge, as it is important to ensure that their property is well-maintained and occupied by responsible individuals. If we narrow down to the situation in our country, inviduals spent most of their time to search for a home rather than deciding on which house to rent. Thus the app saves an important resource of life, time.

The problem of finding houses is hard to solve for many factors. Firstly, one has to store the huge amount of information organizedly. Secondly, a way has to be found to store and view the house location so that the general people can easily understand. Thirdly, one well be able to see only houses in their area of interest. Lastly there has to be some filter and search options to exclude some uninterested houses.

Although majority of the people living in the cities goes through the process of finding houses or tenants, but it only occurs only a small amount of times in their lives. Hence, most of the people are not interested in addressing the problem. Other countries addressed the problem by having local agencies to help people search for houses and tenants. But this solution has its own overhead. The agency approach requires one local office for the agency in each area, leadinf to a large number of manpower and space involved. Besides, there also involves a lot of legal paperworks.

This app is built on android platform. Firebase is used as its database. Here people has to open account with their necessary contact information. While listing a house its location has to be set with an interactive map along with its neccessary information. Rent searchers can look up all the listed houses within a self-defined area. The can also pick many filters to narrow down the house of their choice. All information shown on the app regarding houses are updated in real time. Thus the app simplfies the process of searching houses for rent. This app based approach also solves the problem of high manpower needed to manage a large area for an agency.The app allows renters to browse available listings and submit their own homes for rent, and provides landlords with a platform to find

reliable tenants based on their profile information. By streamlining the process and making it more convenient for both parties, the app hopes to reduce the stress and frustration often associated with the rental process.

2 Problem Definition

The process of finding and renting a home in Bangladesh can be a particularly challenging task, due to a number of factors. One major issue is the high demand for rental housing, which far exceeds the supply in many parts of the country. This has led to rising rental prices and competition, making it difficult for renters to find affordable and suitable homes. Additionally, the lack of a centralized database or platform for rental listings makes it harder for renters to access information about available homes and for landlords to advertise their properties. This can lead to a lot of wasted time and effort for both parties, as they have to search multiple sources and communicate directly with one another to find a match. Furthermore, the traditional process of finding and renting a home in Bangladesh often involves brokers, who can charge high fees and may not always act in the best interests of the renters or landlords. These issues contribute to the overall difficulty of finding and renting a home in Bangladesh and highlight the need for innovative solutions that can address these challenges and make the process more efficient and convenient.

3 Background and related work

There have been a number of efforts in recent years to address the problem of finding and renting a home, both in Bangladesh and globally. Some of the related work in this area includes:

1. **Online platforms:** Several online platforms have been developed to connect renters and landlords and facilitate the process of finding and renting a home. These platforms often allow users to browse listings, create profiles, and communicate with one another directly. Examples include Zillow[1], Rent.com[2], and Airbnb[3].

2. **Brokerage services:** Many traditional brokerage services also offer rental listings and services to help renters and landlords find a match. These services can be helpful, but they often come at a cost and may not always act in the best interests of the renters or landlords.

3. **Government initiatives:** Some governments have implemented initiatives to address the issue of affordable housing and make the process of finding and renting a home easier for low-income individuals and families. These initiatives can include subsidies, rent control policies, and the construction of affordable housing units.

4. **Social media and classifieds:** Some renters and landlords use social media and classifieds platforms, such as Facebook[4] and Craigslist[5], to connect and find rental opportunities. While these platforms can be useful, they do not always provide a comprehensive or organized list of available homes, and it can be difficult to verify the reliability and trustworthiness of the parties involved.

Overall, these related efforts have made some progress in addressing the problem of finding and renting a home, but there is still a need for more innovative and efficient solutions that can better meet the needs of renters and landlords.

4 Methodology

4.1 Platform: Android

The application was made for android[6] platform supporting android 4 and up. The Android platform is a widely popular and widely used operating system for mobile devices, such as smartphones and tablets. Developed by Google and the Open Handset Alliance, it is based on the Linux kernel and designed primarily for touchscreen devices. Android is an open-source platform, meaning that developers can freely modify and distribute the source code, and it has a large and active developer community. This has led to a wide range of apps and features being developed for the platform, making it a versatile and flexible option for app development. The app in this report was built for the Android platform, making it easily accessible for a large number of smartphone users.

4.2 Database

4.2.1 Type and description of database

Firebase[7] is a popular cloud-based NoSQL database service developed by Google. It provides developers with a platform to store and manage data for their applications, and includes a variety of tools and features for

data analysis and real-time synchronization. One of the main advantages of Firebase is its real-time capability, which allows data to be instantly updated and synchronized across all connected devices. This makes it particularly useful for applications that require real-time data updates, such as social networking apps or messaging apps. In the case of the app in this report, Firebase was used as the database service to store and manage the data related to the listings of homes for rent. By using Firebase, the app was able to efficiently store and retrieve data and provide real-time updates to users.

4.2.2 Database structure

The Following database folder and file storage structure is used:

```
|–GeoFireLocations
|    |–"HouseId"(Generated String: "User ID"+"("+"House name", It is the house key, used relat
|    |      |–(Generated child by GeoFire)
|–Users(contains all user related data)
     |–"User ID"
          |–Houses(Contains all houses/to-let data owned to the user)
          |      |–"House Name"
          |           |–bathrooms(int)
          |           |–bedrooms(int)
          |           |–detail(String, data from optional detail)
          |           |–floor(int)
          |           |–isVerified(int)
          |           |–lat(double, latitude of the house location)
          |           |–lng(double, longitude of the house location)
          |           |–name(String)
          |           |–rent(int)
          |           |–size(int)
          |           |–streetAddress(String)
          |–post
          |      |–"post Id"
          |           |–id(String)
          |           |–text(String)
          |–profile
               |–imageUrl(String)
               |–name(String)
               |–registerLatitude(double)
               |–registerLongitude(double)
               |–status(String)
```

|–email(String)
|–contact(String)

Description of each fields above is given below:

- **GeoFireLocations** is a folder containing all the unique identifiers(UID) for each house and their related informations generated by GeoFire library.
- **HouseID** are folders named with unique identifier for each house. The number of HouseID folders hence is equal to the number of total houses contained in the database. The UID is a composite key. It consists of concatenation of 'User ID' of the owner followed by a '(' character and then 'House Name'. Hence, it is impossible for a owner to have two houses with the same name.
- **Genrated Child by GeoFire** are fields containing location informations, latitude and longitude. Another field contains the generated hashcode by GeoFire library.
- **Users** folder contains all related information of users and detailed information of their houses.
- **UserID** folders are named after unique identifire(UID) of each user.
- **Houses** folder contains all house informations which are owned and listed by the current user.
- **HouseName** folder is named by the name of the house owned by the curent user. Allowed characters: 'A' 'Z', 'a' 'z', '0' '9'
- **bathrooms** is an integer type field ranging from 0 to 100. It defines number of bathrooms the house has.
- **bedrooms** is an integer type field ranging from 0 to 100. It defines number of bathrooms/toilets the house has.
- **floor** is an integer type field ranging from 0 to 100. It defines number of floor the house has.
- **rent** is an integer type field ranging from 0 to 100,000,00. It defines the rent per month in Taka of the house.
- **rent** is an integer type field ranging from 10 to 1,000,00. It defines the size in suare feet of the house.

- **detail** is a field of string type containing all optional details given by the user about the house.
- **isVerified** defines whether the house is verified. The app determines if a house is verified if the user is nearby when listing the house.
- **lng** field is of type double containing the longitude of the house location.
- **lat** field is of type double containing the latitude of the house location.
- **name** field contains the name of the house too. First time name was defined in the folder.
- **streetAddress** field contains the street address generated by the system according to the location or defined by the user.
- **post** foder contains all related posts of the current user.
- **id** string type contains unique id of the post.
- **post Id** folder named by the unique identifier of the post containing all related informations to the post.
- **tex** string type field containing the post details.
- **peofile** folder contains all the information and image of the current user.
- **imageUrl** field of type string contains the url of the profile picture given by the user.
- **name(under profile folder)** field of string type contains the name of the current user.
- **registerLongitude** contains the longitude of the place from where the user registered.
- **registerLatitude** contains the latitude of the place from where the user registered.
- **status** field of type string contains the status defined by the user. item **contact** field of type string contains the contact information of the curretn user.
- **email** field of type string contains the email of the curretn user with which the user registered.

4.3 IDE: Android Studio

Android Studio[8] IDE was used to organize the source code, compile and to imulate the app.

4.4 Languages used: Java and HTML

Java[9], a object-oriented programming language, was used for backend coding. HTML[10], a markup language, was used for frontend structure.

4.5 Libraries used

The app in this report made use of several libraries to provide various features and functionality. These libraries include:

1. **GeoFire[11]:** A library that allows developers to easily store and query geographic data in a Firebase[7] database. It is built on top of the Firebase Realtime Database and provides a simple API for adding location data to database nodes and querying that data based on geographic location.

2. **Google Maps API[12]:** A library that allows developers to incorporate maps and location-based features into their applications. The API provides access to a variety of mapping and location data, including street maps, satellite imagery, and real-time traffic updates.

3. **Geocoder[13]:** A library that allows developers to convert between geographic coordinates (latitude and longitude) and human-readable addresses. It is useful for providing location-based services and for displaying location data on a map.

4. **Firebase Auth:** A library that provides authentication and authorization services for applications using the Firebase platform. It allows users to sign up and log in using their email and password, or using third-party providers such as Google or Facebook.

5. **Dexter[14]:** A library that simplifies the process of requesting permissions from users on Android devices. It provides a user-friendly interface and handles the complex logic of requesting and managing permissions.

6. **Glide[15]:** A library that simplifies the process of loading and displaying images in Android applications. It provides features such

as image caching and transformations, and can load images from a variety of sources, including URLs, resources, and file paths.

7. **CircleImageView[16]:** A library that provides a custom image view that displays images in a circular shape. It is useful for creating visually appealing user interfaces and for displaying profile pictures or avatars.

Overall, these libraries helped to provide a wide range of features and functionality for the app, including location-based services, authentication and authorization, image loading and display, and more.

5 Analysis

The following features are implemented in the app 'To-let':

- Registration and login of users from the app as shown in Fig:1a.
- E-mail verification after account creation.
- Implemented Firebase Realtime Database as the DBS(Database SYSTEM).
- Storing the location from which user is registering their new accounts, which can be used by admins later on for many purposes including verification of their owned rental homes.
- Adding To-let as in Fig-2:

  i Selecting To-let location:

  1. Full Interactive map with dedicated button to show current location of User.
  2. Selecting current location.
  3. Long pressing the map to bring a marker(has house icon), the markers position selects the to-let location.
  4. The marker can be dragged to change the selected house location or to adjust the selected location properly.
  5. Passing both user current location or selected location as listed house location.

  ii Editing House location details and storing to database:

1. Majority house details can be given with provided Edit fields.
2. **This page also shows the selected house location with interactive map.**
3. **Street adress for the house is auto generated base on the house location with the help of Geocoder.**
4. If we give any invalid info it shows details of error corresponding to the field where the error occured.
5. **Detects whether the provided House Name/To-let name is unique among all the House names belonging to that user.**
6. Unique Id of the house is created in combination of the user Id and the house name and this unique house Id is used as key of the house
7. **The Unique house key along with the location is stored with as hashcode with the help og GeoFire library.**
8. All information are stored in Firebase.
9. **Checks whether the user was far away from the house while adding the house to determine whether the house is verified or not.**

- Searching To-let as in fig-3b:

  i Selecting location around which search will be conducted:

  1. Full Interactive map with dedicated button to show current location of User.
  2. Selecting current location.
  3. Long pressing the map to bring a marker(has person icon), the markers position selects search location.
  4. The marker can be dragged to change the selected search location or to adjust the selected location properly.

  ii Search results showing and filtering:

  1. The radius around the location can be specified, with which we will conduct the search.
  2. The search results can be filtered with the help of various fields.
  3. The filter fields also have error checking system.
  4. Resulting houses are showed on the map with a house icon.

5. tapping on a house icon will show a short description of the house along with its verification status.
6. All resulted houses are shown as a Scrollable list with short description.

- Internet connection check is performed whenever internet connection is necessary and prompts the user through a dialog box to connect to the internet by taking them to the Wifi setting if they select so.
- We can always get updated Database snapshot throughout the application by accessing the static member variable mDatabaseInfoHelper of HouseInfo class which is initialized at the start of the app.
- Post about house on the timeline as in figure: 3a.
- Changing profile information including picture.
- Some other minor features.

6 Conclusion

The app developed in this paper aims to address the problem of finding and renting a home by providing a convenient and efficient platform for renters and landlords to connect and browse available options. The app was well received by users and effectively served its intended purpose, as it provided an organized and user-friendly interface for browsing listings and submitting homes for rent. The app also incorporated location-based features, such as mapping and radius search, to help users find available homes in their desired area.

Overall, the app demonstrates the potential for technology to streamline and improve the process of finding and renting a home. It has the potential to significantly impact the lives of individuals and families seeking housing, as well as to improve the overall functioning and stability of the rental market. Further research could be conducted to assess the long-term impact and potential for expansion of the app in the rental market.

Git repository The Git repository of 'To-let' app can be found at the link: `https://github.com/cse-250-2018/G12-To-let`.

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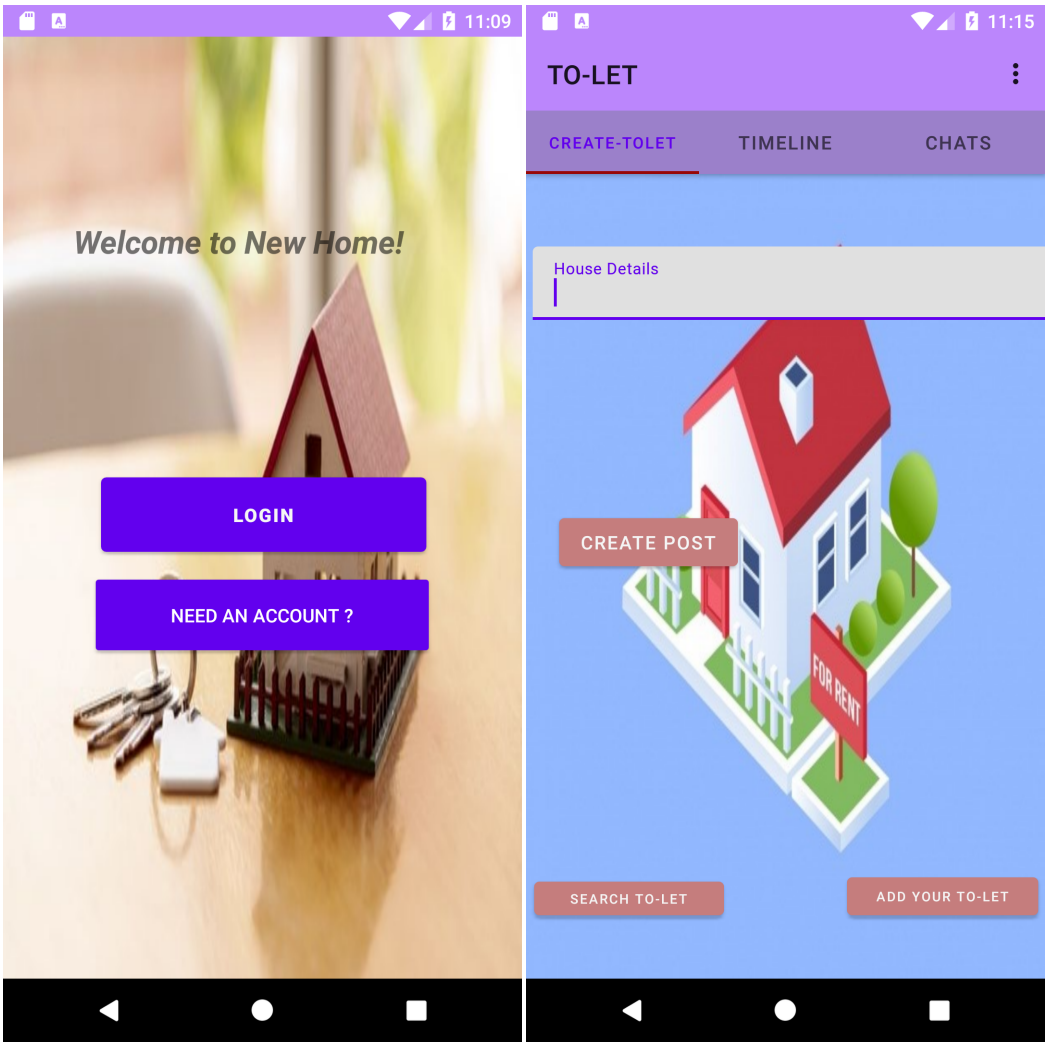
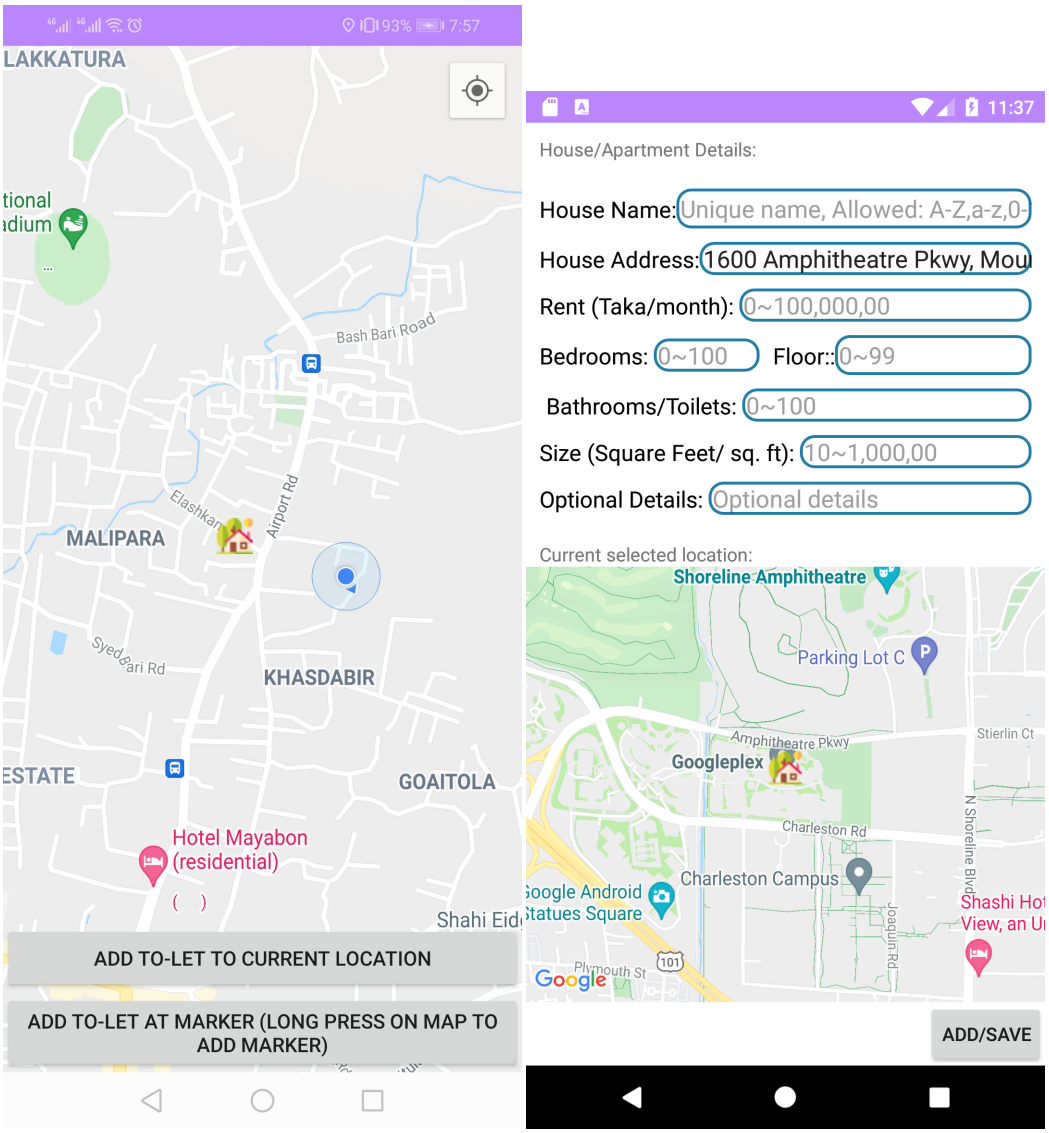


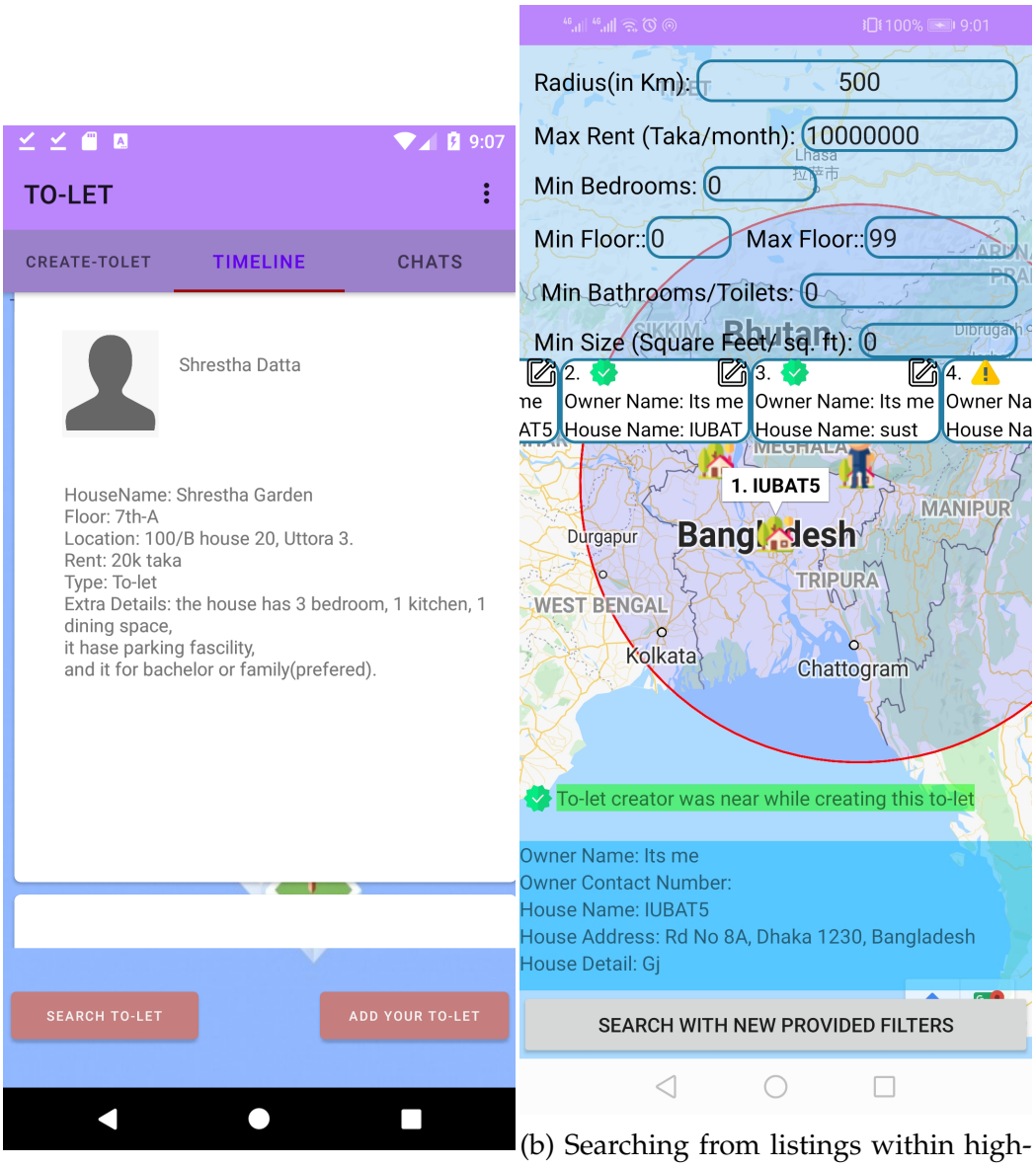
(a) Login and Register Page (b) Home Page

Figure 1: Login, register and homepage of the app



(a) Add listing page (b) Listing details page

Figure 2: Adding a listing from the app



(a) A post details in the timeline section

(b) Searching from listings within highlighted area

Figure 3: Timeline section and Search section from the app