Homes.Design System Requirements
Inf 43 – Homework 1

Feb 09, 2022

Introduction

Homes.design specification requirements aims to present an in-depth account of the web application 'Homes.design' intended to provide interior design services. It will thoroughly outline the purpose and the features of the web-based application.

Designing personal spaces can be time consuming, expensive and difficult to visualize for both the designer and the customer. Therefore, Homes Corporation, a company that specializes in interior design, wants an innovative user-friendly solution to revolutionize interior designing for any revamping or renovation projects.

The software system will use artificial intelligence, or an AI, to automate the process of interior designing. Homes.design will enable users to customize their spaces according to their design preferences by naturally conversing to the system whenever they want.

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Overview/Executive Summary	Homes.design's goals and major features
Application Context/Environmental Constraints	Where Homes.design will be used, constraints, and the software that Homes.design interacts with.
Functional Requirements	Describes Homes.design's capabilities and attributes. Characterizes the properties, states, functions, and interrelationships of each entity.
Software Qualities and Non-Functional Requirements	Discusses Homes.design qualities and constraints pertaining to those qualities.
Other Requirements	Describes additional requirements that are not listed yet, such as budget and timeline
Assumptions/ Risks	Lists any known risks to the project and assumptions not covered previously.
Priorities/ Implementation Phases	Lists subsets of the system's functionality in order of priority (order of implementation).

Future Directions and Expected Change	Lists any future implementations that can be made after the first version of Homes.design

Overview / Executive Summary

The primary goal of Homes.design is to provide innovative and customized interior design services to users. It aims to automate interior designing and provide users with a fun, friendly, creative and engaging experience. Designing personal spaces can often be a challenging process, and require a significant investment of time and money. It can be especially difficult for both designers and customers to envision the final outcome of the design. Hence a naturally conversational application that shows possible interior design renderings would effectively and efficiently address the pains and frustrations that come with designing a space. Homes.design seeks to simplify interior design for homeowners, renters, and interior designers. It provides ideas and inspiration for decorating personal spaces, and recommends them with items from furniture stores.

The customer will be able to provide natural language as input in a plain text box, as if they were conversing with the software, and specify what it is that they are looking for whether it be colors, themes, or budgetary restrictions. The inviting interface will ask them to create an account and enter the pictures, floor plan, and dimensions of the space they are designing. Consequently, the software will produce rendering of the interior with recommended items based on the input. They would also be able to save the chats with the software, otherwise known as sessions, and revisit them later on if they choose to do so. The software offers tremendous flexibility in allowing the user to make decisions by also giving the option to start new sessions, delete old sessions, and have different sessions for different spaces.

Each session will be separate and the software will only remember and save the preferences for that specific session, allowing the user to have a blank canvas with a new session. In the event that a saved session does not have the product anymore, the software will inform the user and generate new rendering that they might like. The user can also specify in the text box what they would like to change about the renderings and get new media renderings.

The application will be trained on from various outlets like magazines and interior designing inspirations like the Architectural Digest, to broaden the perspective of the software. It will provide rendering of the user's personal space as well as provide affiliate

links to buy those pieces of furniture. Homes.design will enable users to customize their spaces according to their design preferences by conversing to the system whenever they want, therefore decreasing the associated time and cost, and increasing the visualization ability.

Application Context / Environmental Constraints

Homes.design is a web-based application that can be accessed on desktops, laptops, personal devices, and any other platform capable of supporting the application's artificial intelligence software and rendering photos and videos produced by the AI.

There is no specific hardware requirement: as long as the device can support the photo and video rendering and the website's software system, no other hardware constraints are imposed. Since the application's main objective is to allow users to visualize different interior design options, all supported platforms should be able to generate high-quality renderings of the designs.

There is no constraint on the programming language. Neither is there any constraint on the specific operating system to be used, therefore if the operating system's browser can support the web-based application Homes.design, the software will be compatible with that operating system.
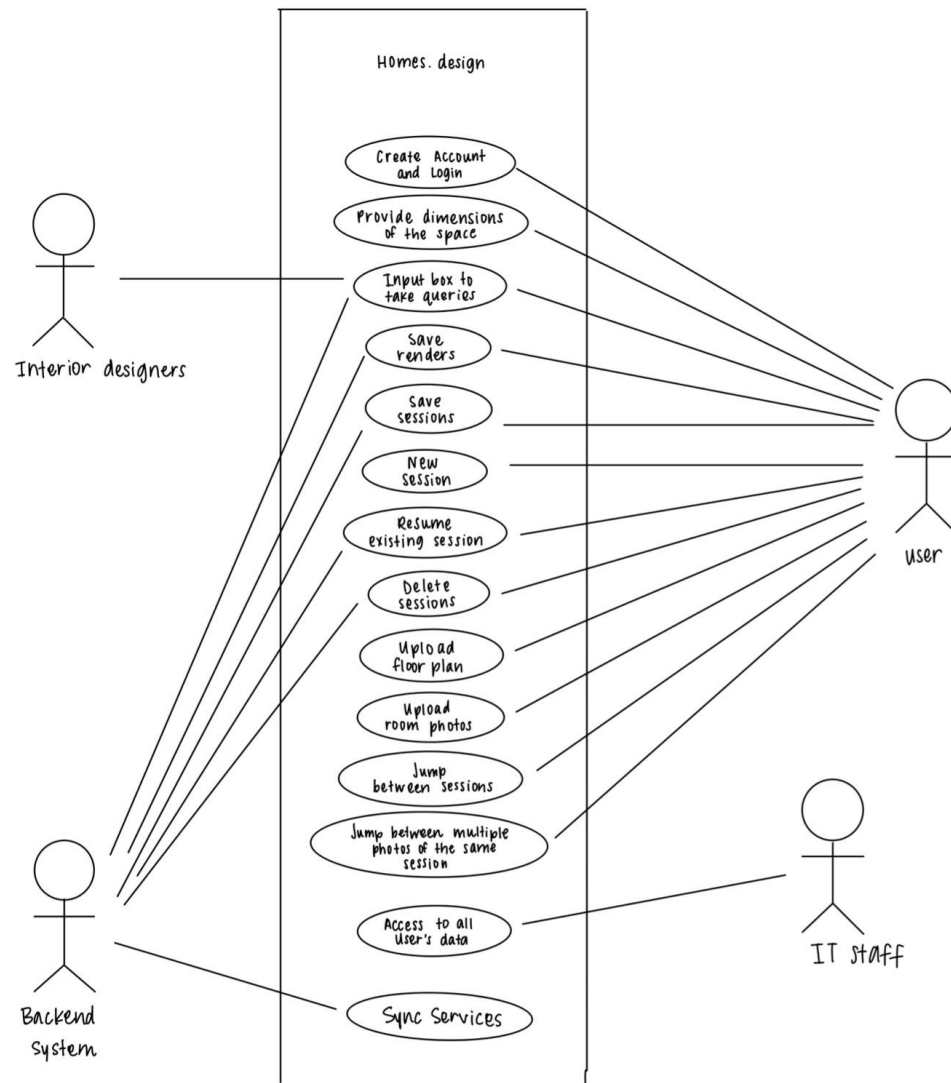
The design of the website should be simple and minimalistic. The application should take a naturally conversational input in a search bar and produce possible photo renderings. There would not be any buttons or categories to input your preferences. The goal is to be able to talk to the software rather than give a predefined, unmodifiable input.

The website will be free-of-cost to all users.

Functional Requirements

Actors: Users, Back-end System, IT Staff, Interior Designers

Homes. design

- Create Account and Login
- Provide dimensions of the space
- Input box to take queries
- Save renders
- Save sessions
- New session
- Resume existing session
- Delete sessions
- Upload floor plan
- Upload room photos
- Jump between sessions
- Jump between multiple photos of the same session
- Access to all user's data
- Sync Services

Interior designers

User

Backend System

IT staff

Users:
- **Create account and login**
  - Homes.design requires all users to create an account before accessing any features of the application. The account information will be used to store

floor plans, space dimensions, personal space pictures, saved sessions and any other user data.

- **Provide dimensions of the space**
  - The user will be able to provide dimensions of their space and label where each of the uploaded photos was taken to provide a better visual to the software to extrapolate the users' space.
- **Input box to take queries**
  - The user will be able to use natural conversation language to converse with the software and input the specifications they prefer. The back-end system, or the AI, will then generate image and video rendering of the provided space to give a better visual representation to the user, and provide them with affiliate links to those furniture pieces. In the event that the user does not like the rendered media, they can specify, in the same session, what they would like the software to change and what to keep. This will allow them to personalize their space according to their requirements and preferences.
- **Save renders**
  - Users have the option to save the renders that the system will generate, so that they can easily access their favorite interior designs whenever they would like.
- **Save sessions**
  - Users also have the ability to save the chats between them and the software system, so revisit later on. This would hold all the rendered media in that session and the affiliate links provided. In the event that the affiliate links are no longer available, the software would inform the user and ask them if they would like it to suggest others.
- **New session**
  - Users also have the option to have multiple sessions open or create a new session. Each session will only hold the information and preferences that it learned from that session, hence each new session will be a new blank, objective, and open-minded slate for the user to start again.
- **Resume existing session**
  - Users would be able to resume an existing session with the software that was done at another point in time. That existing session would be biased with the information that the software learned in the surviving session, and therefore the recommendations will be based on what you liked and did not like in that session.
- **Delete sessions**

- Users are able to delete any session from Homes.design that they might have saved. Deleting sessions would delete it from memory forever, and the user would not be able to access later on.
- **Upload floor plan (at least two points)**
  - Users have to upload their floor plans to give the software access to the dimensions of the space that is being designed.
- **Upload room photos**
  - Users also have to upload pictures of their personal space in order to provide an accurate representation of the space to the software system, as well as to gain an accurate rendering of what the suggested furniture pieces might look like in the users' personal space.
- **Jump between sessions**
  - Users are able to jump between multiple sessions without having to save or delete one or the other session.
- **Jump between multiple photos of the same session**
  - Users are also able to jump between multiple photos in the same session, to gain a better understanding of their redesigned personal space from multiple perspectives. They can also design multiple rooms with the same aesthetic this way since the software will learn from what the user liked in that specific session, thus allowing the user to have uniform design choices if they wanted.

Interior Designers
- **Input box to take queries**
  - In the initial version of Homes.design interior designers would assist the AI in making recommendations to the users.

Back-end System
(In addition to supporting all users' actions)
- **Sync Service**
  - Homes.design's back-end system syncs saved sessions, floor plans, and the dimensions of the space across all devices with the same account, so users can access their interior designed renderings and sessions on all supported devices and browsers by logging in to their account. The sync service is available to users free of charge that have created an account with Homes.design.
- **User actions**
  - Back-end system will support all user functionality and make changes to user accounts. User functionality such as taking queries, saving renders, saving sessions, creating new sessions, resuming existing sessions, and

deleting sessions would all require the back-end system to process requests, generate renders, modify existing information, and provide affiliate links.

IT Staff
- **Access to all users' data**
  - The IT Admin hired by Homes Corporation will have access to all users' data, which are the users' email addresses, floor plans, and space dimensions, in case the admin needs to fix some data corruption.

Software Qualities and Non-functional Requirements

Usability	The software system should be user-friendly, and allow them to effectively utilize the application without encountering any obstacles and difficulties. It should be fun, engaging and intuitive for the user, and simple to use as there would not be any user manuals provided with the software.
Privacy and Security	The personal information that will be collected from users is the user's email address, their floor plans, and the pictures of the room that they want to redesign. Users cannot see each other's floor plans, room pictures and dimensions, and any and all conversations that they have with the Homes.design's software system.
Maintainability	It is important that Homes.design is easy to maintain. After the initial launch, a rotating team of employees will continue to work on and develop the software system, including the implementation of additional features such as the Homes marketplace and augmented reality.
Performance	Since the software system depends on AI, it is imperative that the results do not take excessively long to generate. The software is expected to be accurate most of the time, and the final version should not take longer than around 20 seconds to render designs.

Robustness	Since the text box input to the software system is freeform, the Homes.design should be robust enough to reliably and smoothly handle the variety of design requests it might get. There isn't any preset information given in a toggle bar for the users to select, hence the software should be able to handle many types of situations.

Other Requirements

Timeline:

February 10, 2023	Homes.design Requirements Specification document due.
March 26, 2023	Non-functional initial prototype
January 26, 2024	Initial version with human assisted AI
January 26, 2025	Initial version, fully automated, with images videos and walkthroughs

Budget:
The estimated total cost of the application is $2 million, with $1 million dedicated from Phase 1 till the end of Phase 3, and another $1 million dedicated from Phase 3 till the end of Phase 4

Appearance:
The appearance should look simple, minimalistic, fun, creative, and engaging.

Interface:
The web application contains account information of the user. Associated with respective accounts, it also contains floor plans and pictures of the place to be designed as uploaded by the user. The interface would also contain a place to save sessions, create new sessions, delete sessions and revisit old saved sessions.

Disclaimer:
Homes Corporation is not responsible for any problems that may arise as a result of Homes.design. The software system is intended to provide interior design recommendations and give creative ideas. It is up to the user to ensure the safety and efficient implementation of the interior designs generated by the software.

Glossary of terms

UI	UI stands for User Interface, which refers to the interface that a user interacts with in order to use a software application.
AI	AI stands for Artificial Intelligence, which refers to the technology that allows machines to do tasks that would otherwise need human intelligence.
Render	The process of creating an image or animation using a computer program.
Session	A chat between the user and the software.
Back-end system	A component of the software application that is responsible for processing and storing data, and providing the necessary functionality to keep the system running.

Assumptions / Risks

Assumptions
- It is assumed that the user is capable of taking good pictures of the space that they are trying to decorate. They would make sure to take the pictures in good lighting, and prevent things that might block the AI's ability to detect the full extent of the space. The better the pictures they are able to capture, the easier it will be for the software to remove the obstructions and show renderings of the redesigned space.
- It is assumed that the user will exercise caution in proceeding with the designs that the software produces. If the design rendered by the software covers an outlet or fire escape, it is up to the user to examine and implement the design. For this reason, Homes.design will have an user agreement to not hold Homes Corporation liable for any trouble they might encounter with the designs. The application is for decorative and suggestive purposes, hence the implementation is up to the user ultimately.
- It is assumed that the user would give a clear, concise and detailed input to obtain the best possible output. Since the entry to the software is through a simple text box conversation, the user would have to specify their preferences explicitly, about parameters like budget, style, color, and theme, to get the most accurate and close to imagination renderings.

- It is assumed that the user knows and understands English. Initially, the application will only be available in English; hence, if the user wants to utilize it, they would have to know English.

Risks:
- There is a risk that the software system might not be able to remove the existing furniture from the uploaded photos as a result of image distortions, bad lighting, or incomprehensible boundaries, in which case the AI might fail to properly render photo and video renderings.
- There is also a risk that the user does not take into account the safety aspect of the design that the AI generates, and might implement unsafe designs into their space.

Priorities / Implementation Phases

Phase 1: Requirement documentation
- Deadline: February 10, 2023
- Milestone: Completion of the Homes.design requirements specification document.

Phase 2: Initial Prototype
- Deadline: March 26, 2023
- Milestone: Completion of the non-functional Homes.design application to gain an overall impression of the system.

Phase 3: Human-Assisted Version
- Deadline: January 26, 2024
- Milestone: Completion of the artificial intelligence component assisted by human interior designers to render designs.

Phase 4: Fully Automated Version
- Deadline: January 26, 2025
- Milestone: Completion of fully automated Homes.design application with image, video, and video walkthrough renderings.

Future Directions and Expected Changes

In the future, Homes.design is considering to add additional features listed below:
- Homes Marketplace
  Homes Corporation is also interested in integrating a marketplace to allow users to upload their furniture to sell to other users, and providing a more expansive catalogue of furniture selections.
- Augmented Reality
  Homes Corporation is interested in expanding the AI to generate 3D rendering of users' personal space, and provide them with an even more visual and immersive experience.
- Cloud Computing
  Homes Corporation is willing to invest in cloud computing in the future.
- Other Countries
  They are also willing to expand their business to other countries in future based on initial reaction.