INTERNATIONAL ISLAMIC UNIVERSITY, ISLAMABAD

DEPARTMENT OF SOFTWARE ENGINEERING

COURSE: SE302 Software Construction and Development

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Module: 02

Virtual Interior Designer

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Virtual Interior Designer – Project Description

The **Virtual Interior Designer** is an AI-powered web application that helps users redesign their living spaces by providing **personalized interior design suggestions** based on uploaded room images. Using **computer vision and AI**, the system analyzes room dimensions, lighting, furniture, and color schemes to generate tailored design recommendations.

Functional Requirements:

✅ **Upload Picture:** Users can upload a photo of their room or any space for AI analysis.

✅ **AI-Driven Image Analysis:** Detects room attributes like furniture layout, wall colors, and lighting.

✅ **Personalized Design Suggestions:** Provides interior styles based on user preferences (modern, vintage, minimalistic, etc.).

✅ **Interactive Design Customization:** Allows users to swap furniture, modify layouts, and change colors.

✅ **Smart Shopping & Budget Optimization:** Recommends budget-friendly and premium furniture options multiple retailers.

✅ **Social & Sharing Features:** Users can share designs on social media for feedback.

✅ **Space Functionality Considerations:** Optimized layouts based on space type (Indorr, Outdoor, etc.).

✅ **Wall & Flooring Recommendations:** AI suggests wall colors, wallpaper, or texture options based on the current interior style. The system shall provide flooring recommendations (hardwood, carpet, tiles, etc.).

Actor Classification Checklist:

Category	Actor Name					
	VID User	AI-based Interior Design System	AI-based Shopping & Budget System	Database	Social Media Platforms	Camera and Display Device
User	✓	✗	✗	✗	✗	✗
System	✗	✓	✓	✓	✓	✗
Hardware	✗	✗	✗	✗	✗	✓

Actor Identification Checklist:

Questions	Actor Name					
	VID User	AI-based Interior Design System	AI-based Shopping & Budget System	Data-base	Social Media Plat-forms	Camera and Display Device
Who uses the system?	✓	✗	✗	✗	✗	✗
Who installs the system?	✗	✗	✗	✗	✗	✗
Who starts up the system?	✗	✗	✗	✗	✗	✗
Who maintains the system?	✗	✗	✗	✗	✗	✗
Who shuts down the system?	✗	✗	✗	✗	✗	✗
What other systems use this system?	✗	✓	✓	✓	✓	✗
Who gets information from this system?	✗	✓	✗	✓	✓	✗
Who provides information to the system?	✗	✓	✓	✓	✗	✓

Use Case Identification Checklist:

Use Cases		What functions will the actor want from the system?	Does the system store information? What actors will create, read, update or delete this information?
UC-1	Upload Image	✅ Yes Users upload images for AI analysis.	✅ Yes Stores uploaded images for analysis. (**User** , **Database**)
UC-2	Analyze Image Features	✅ Yes AI should detect room attributes like furniture, walls, and lighting.	✅ Yes Extracts and saves room attributes. (**AI-Based Interior Design System Database**)
UC-3	Customize Design	✅ Yes Users can swap furniture, change colors, and modify layouts.	✅ Yes Tracks changes made by the user to designs. (**User**, **Database**)
UC-4	Optimize Shopping & Budget	✅ Yes AI suggests furniture options based on user budget.	✅ Yes Saves user budget preferences. (**User, Database**)
UC-5	Share Design on Social Media	✅ Yes Users can share finalized designs for feedback.	NA
UC-6	Optimize Space Functionality	✅ Yes AI suggests functional improvements for different room types.	NA
UC-7	Recommend Wall & Flooring	✅ Yes AI provides wall and flooring recommendations.	NA

Use Cases		Does the system need to notify an actor about changes in the internal state?	Are there any external events the system must know about? What actor informs the system of those events?
UC-1	Upload Image	NA	✅ Yes Triggered when the user uploads an image. - **User** (Informs the system by uploading an image)
UC-2	Analyze Image Features	NA	NA
UC-3	Customize Design	✅ Yes Notifies the user when AI-generated design is ready.	NA
UC-4	Optimize Shopping & Budget	✅ Yes Notifies and Updates budget recommendations.	NA
UC-5	Share Design on Social Media	NA	✅ Yes Triggered when the user decides to share their design. - **User** (Informs the system by deciding to share the design) - **Social Media Platforms** (Receives shared designs)
UC-6	Optimize Space Functionality	NA	NA
UC-7	Recommend Wall & Flooring	NA	NA

Include Relationship:

Reasons	Use Case: Suggest Lighting and Ambience
Problem: There are already existing functions. How can we reuse them? Use include when you are repeating yourself in two or more separate use cases and you want to avoid repetition.	**NA**
Problem: A function in the original problem statement is too complex to be solvable immediately A use case is very complex and long and separating it into subunits aids comprehension.	✅ Yes - **Analyze Room Features (UC-2)** is a broad use case that involves multiple aspects of the room (walls, flooring, furniture, lighting). -Since **lighting analysis** is always a required step, it is better to **separate** it into a **smaller, reusable use case**. - 💡 **Conclusion:** The "Include" use case Suggest Lighting & Ambience ensures that every time Analyze Room Features runs, lighting analysis is performed as well.

Extend Relationship:

Reasons	Use Cases: Generate Design Suggestions and Display Estimated Cost
Problem: The functionality in the original problem statement needs to be extended. The idea is to create an extending or addition use case, and within it, describe where and under what condition it extends the behavior of some base use case.	✅ Yes 1. **Customize Room Design(UC-3) → Extends: Generate Design Suggestions** - Generate Design Suggestions is the main process. - However, not all users will want to customize the AI-suggested design, some may accept the generated layout as-is. - Therefore, customization only occurs optionally.

	2. Optimize Shopping & Budget(UC-4) →Extends: Display Estimated Cost - Display Estimated Cost provides the total cost based on the selected design. - Optimize Shopping & Budget extends this by helping users adjust their furniture selection based on budget preferences. - However, this is only needed if the user wants to see cost details.

Generalization Relationship:

Reasons	Use Cases
Problem: You have common behavior among use cases and want to factor this out. Generalization factors out common behavior, allowing child use cases to inherit and modify the parent's functionality.	✅ Yes **1. Optimize Space Functionality(UC-6) → Generalized for different room types:** - Optimize OutdoorSpace (Weather Protection, Seating Area) - Optimize IndoorSpace (Social space, comfort focus, Temperature Control) **2. Recommend Wall & Flooring(UC-7) → Generalized for material preferences:** - Eco-Friendly Wall & Flooring (Sustainable materials) - Luxury Wall & Flooring (Premium high-end materials)