

AI Powered Virtual Interior Designer

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Abstract - Traditional interior design takes a lot of time, money and effort because it's relies on manual drawing, creativity and multiple design revisions. Clients often find it difficult to imagine how their room will look after redesign, which leads to confusion and changes that increase cost and delay the process.

To solve these problems, an AI-powered virtual interior designer system is developed. Users can upload a room image and enter their preferred style, like modern, luxury, or minimal. The AI then automatically analyzes the image and generates a redesigned version that matches the user's choice. This makes interior designing faster, more creative, cost effective and easier for both designers and normal users.

Key Words: Artificial Intelligence, Automated Design System, Image-Based Redesign, User Prompt Processing, Virtual Interior Design, Personalized Interior Solutions.

1.INTRODUCTION

Interior design traditionally depends on manual planning, creativity, and strong visualization abilities, making the process slow, costly and challenging for both professionals and clients. Designers often create multiple sketches and digital layouts to satisfy expectations, while users find it difficult to imagine how a space will look after modifications. This results in frequent revisions, communication issues, and increased expenses, highlighting the limitations of conventional design practices.

With the rising demand for quick customized, and visually accurate interior solutions, smart technologies have started reshaping the design industry. Artificial intelligence (AI) offers automated, efficient, and user friendly methods for producing realistic visual outputs. AI driven tools are capable of analyzing room layouts, understanding styling preferences, and generating creative design variations without extensive manual effort.

The project introduces an AI-powered virtual interior designer system that restyles existing room images based on user prompts. Users can upload any interior photograph and specify preferences such as theme, color palette, furniture arrangement, or decoration style. The system interprets the input and instantly produces a redesigned image that reflects the given choices. This innovative solution enhances creativity, reduces the time and cost, and effectively bridges the gap between imagination and practical visualization.

1.1 Description

The AI-Powered Virtual Interior Designer is an innovative solution developed to automate and enhance the design process using Artificial Intelligence and Machine Learning. Its objective is to help users visualize and customize indoor spaces with precision and convenience. Conventional methods require manual planning, multiple revisions, and considerable expense to test styles, choose color schemes, or finalize decor concepts. To address these limitations, the proposed system offers an intelligent and automated platforms capable of generating design suggestions within seconds.

The system enables users to upload any room image, which is then processed through AI based algorithms to identify structural elements, existing furniture, lighting conditions, and color patterns. After analyses, it applies appropriate style preferences such as modern, classic, contemporary or minimalistic to produce realistic visual transformations. This provides users with multiple design variations, enabling better decision making without professional assistance.

Developed using Python, the system incorporates computer vision and Deep learning models for image recognition and style transfer. It also includes a secure authentication module and database support for customized access and saving previous designs. By reducing time, minimizing cost and enhancing creativity, the AI powered interior designing system delivers a smart, efficient and user friendly approach to interior design.

1.2 Existing System

Users experience less accessibility, lengthier design cycles, and restricted visualization possibilities as a result of these constraints.

- Interior design by hand with conventional tools.
- Visualization requires high time, effort, and cost.
- Existing automated tools require paid subscriptions
- Limited real-time design interaction for users.

These are the current platforms features.

1.3 Proposed System

An AI powered system transforms interior images into new styles using deep learning and Stable Diffusion model v1.5.

- AI uses deep learning to automatically restyle interior photos.
- Stable Diffusion v1.5 is used to change images in a realistic way.
- Users provide style suggestions and post pictures of their rooms.
- Creates updated images instantly.
- Increases creativity and saves time.

1.4 Objectives

- To develop an AI based system capable of redesigning and restyling interior images automatically based on the user provided prompts.
- To implement Stable Diffusion v.5 model using Hugging face diffusers and Py-Torch for high-quality, realistic image to image generation.
- To create an easy to use interface that allows users to upload images, select styles, and visualize redesigned output efficiently.
- To enhance the overall interior design process by reducing manual effort, improving creativity, and delivering instant, and realistic design visualizations.

2. LITERATURE SURVEY

A Literature Survey provides an overview of existing research, technologies and methods related to Artificial intelligence driven interior image redesign. It examines previous studies on deep learning, image to image generation, and diffusion models to identify current trends, gaps and advancement in automated interior styling. It helps in understanding the foundation and supporting the development of proposed Artificial intelligence based system.

Table -1: Literature Survey

| Title | Authors | Methodology | Gap |
|--|----------------------------------|---|---|
| AI-Powered Interior Design Suggestion System Using Deep Learning | John Mathew (2018) | Uses deep learning to generate personalized design suggestions from room images and user preferences. | Did not integrate 3D model customization |
| Smart Home Décor Using AR And AI | Priya Deshmukh (2021) | Combines AR and AI to visualize décor in actual space and make design recommendations based on style preference | Prototype focused mainly on object placement without AI based spatial recognition or autoscaling. |
| Web based room layout planner with AI suggestions | Amit Verma (2020) | AI based room planner that analyzes dimensions and user preferences to suggest efficient furniture layout | The AI module was basic, with limited scene understanding and interactivity. |
| Augmented Reality in Interior Design | Singh P, Dewari S, Jain S (2019) | Discussed applications of AR in interior design, focusing on visualization and cost/time benefits | Mostly a conceptual study; lacks technical implementation or prototype |

This section highlights the gaps that drive the proposed AI powered virtual interior design system and provides an overview of sample work in each field.

3. SYSTEM REQUIREMENTS AND SPECIFICATION

The system requires basic user operations such as registration, login, authentication, room image upload, design recommendation generation, data storage, and secure logout. It also demands a simple and user friendly interface with fast response time, secure credential handling, modular and maintainable code, portability across operating systems supporting Python and Gradio, and scalability for adding future functionalities.

The system is designed to run on Windows 10/11 using Python 3.7 or higher, with essential libraries such as Gradio, sqlite3, os, sys, PIL, and torch, and uses SQLite as the primary database, developed within Google Colab. It requires at least a dual-core processor, 4 GB RAM, around 1 GB of free storage space, and optionally a GPU to enhance AI-based image processing performance.

4. IMPLEMENTATION

The system is implemented using Python with Gradio for user interface and SQLite for data storage. Users upload room images, which are processed using AI models (torch and PIL) to generate design recommendations. The modular structure ensures easy integration of additional features and smooth execution across supported operating systems.

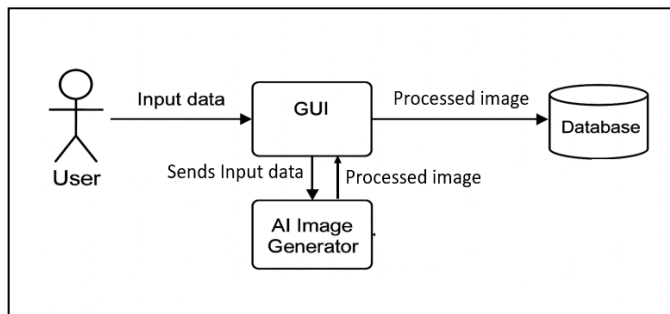


Fig -1: System Design

5. RESULTS AND EVALUATION

The system successfully generated interior design recommendation based on user uploaded room images, producing accurate and visually enhanced outputs. User interactions such as login, image upload, and design retrieval performed smoothly with quick response times. Overall, the system delivered consistent and reliable results across multiple test cases.

Performance evaluation showed that the system responded within seconds for all major operations, meeting the defined non functional requirements. User testing indicated high satisfaction with interface simplicity, design clarity, and output quality. The system demonstrated good stability, portability and scalability during functional and stress testing.

6. DISCUSSION

The developed system demonstrates that AI based interior design assistance can significantly simplify the design process for users by automating image analysis and generating design recommendations efficiently. The results show that the system is easy to use, delivers quick responses, and maintains stable performance across different test scenarios. Although the current model provides effective design suggestions, further improvements such as adding more style options, enhancing model accuracy, and enabling real time previews can make the system even more powerful and user-centric.

7. CONCLUSION

The project effectively illustrates how automation in technology may make interior design simpler. The system

provides a contemporary method for coming up with interior design concepts by combining Python, Gradio, and image processing tools. The procedure is made more participatory and effective by the ease with which people can upload a photograph of a room and select their favourite design style.

Without the need for expert help, the system swiftly processes the input and creates a redesigned output that highlights many design options. It is appropriate for regular customers who seek quick design recommendations because of its user-friendly interface and dependable functionality. The entire design process is accelerated and less manual labour is required thanks to the automated approach.

Overall, the project's goals of increasing accessibility, reducing time, and fostering innovation in interior design are met. It offers a useful, clever, and intuitive platform that makes it easy for users to experiment with design concepts.

This interactive desktop program demonstrates how AI-powered tools can make interior design more accessible and interesting for a larger audience.

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