AI Interior Design

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The Future of Interior Design

Interior design today is a slow and complex process that often relies on expensive professional designers and fragmented digital tools. Users struggle to visualize changes in real time and experiment with personalized styles.

Why It's Challenging

- Combining image and text input.
- Seamlessly integrating new elements.
- Maintaining consistent lighting and geometry.

Current Approaches

- Expensive and time consuming.
- Lack customization and immediate visualization.
- Often lack realism and editing capabilities.

Redefining Room Transformations

The system receives a room image and a text request describing furniture, style, or mood, and generates a redesigned room that aligns with the user's intent. Optionally, approved designs include downloadable 3D furniture models.

Furniture Handling

Users can preserve selected objects while removing or replacing others.

Blueprint Generation

Approved designs provide accurate, ready to build 3D models for each new item.

Smart Wall Repainting

Wall colors are changed without affecting ceilings or architectural details.

> This project offers unprecedented novelty by integrating multimodal input, object aware editing, and practical 3D model output in a single, intuitive workflow.

Models & Methods: Our Technical Pipeline

Our system uses a multi stage AI pipeline to deliver realistic and consistent interior transformations.

01

Image Segmentation

Models such as SAM or Mask2Former segment the room into walls, floor, ceiling, and furniture objects.

02

Semantic Generation

Diffusion models with ControlNet generate and edit furniture while preserving scene structure and lighting.

03

Inpainting & Layout Preservation

Advanced inpainting ensures natural removal of objects and seamless integration of new elements.

04

3D Reconstruction

Dedicated 3D reconstruction models transform generated furniture into accurate, production-ready 3D blueprints.

Data Specification & Generation

1

Interior Design Datasets

Large scale datasets with room images, furniture types, and architectural styles.

2

Segmentation Datasets

Pixel level annotated masks for walls, floors, ceilings, and furniture.

3

3D Object Datasets

High quality 3D furniture datasets for reconstruction and blueprint generation.

Labeling & Annotation

- Room segmentation: Walls, floors, ceilings, and objects.
- Furniture classes: Categorizing different furniture types.
- Style & mood tags: Semantic labels for text prompts.

Synthetic Data Generation

AI generated room layouts, furniture variations, and paired image and text samples to expand training diversity and improve model robustness.

Metrics & KPIs: Measuring Success

Final Output Evaluation

CLIPScore
alignment between generated room and user prompt.

FID/KID Scores
visual realism compared to real interiors.

SSIM/LPIPS
preservation of original room structure.

Stage Specific Quality Metrics

3D Reconstruction
- PSNR, SSIM for image to 3D accuracy
- Camera pose accuracy
- Mesh completeness

Rendering Quality
- Geometric fidelity
- Normal map consistency
- Lighting accuracy

Room Editing/Inpainting
- Seam quality (no visible blending artifacts)
- Layout preservation
- Furniture placement accuracy
- Wall color fidelity

3D Furniture Models
- Chamfer Distance for shape similarity
- Mesh smoothness and watertightness
- Texture quality
- Blueprint accuracy

Measurement Protocols & Ground Truth

Comparison to Original User Images
Compare generated images with original user images and prompts.

Mask Annotations
Use pixel level masks for walls, ceilings, and furniture as ground truth.

Depth Maps
Validate spatial accuracy using depth map.