International Journal of Applied Home Science
(An International Double Blind Peer Reviewed / Refereed Research Journal of Home Science)
Volume 12 (3 & 4), March & April (2025) : 175-179
Received : 23.02.2025; Revised : 09.03.2025; Accepted : 23.03.2025

REVIEW PAPER
ISSN : 2394-1413 (Print)
DOI: 10.36537/IJAHS/12.3&4/175-179

AI Tools in Interior Decoration: Features, Strengths and Limitations

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ABSTRACT

The integration of Artificial Intelligence (AI) in interior decoration is revolutionizing the design industry by enhancing creativity, efficiency and personalization. This paper evaluates various AI-powered design tools, comparing their features, strengths and limitations. Through a detailed review of existing literature, it explores AI's role in layout optimization, visual rendering, style customization and professional design assistance. The comparative analysis of AI tools such as Planner 5D, Homestyler, Modsy and RoomGPT highlights their diverse applications and usability. While AI-driven design tools improve visualization, streamline workflows and offer data-driven recommendations, challenges such as reliance on data quality, limited creative intuition and ethical concerns persist. This study provides insights into the evolving impact of AI on interior decoration, emphasizing the need for a balanced approach that leverages AI's capabilities while retaining human artistic expertise.

Keywords: Artificial intelligence, Interior Design, AI-Driven Visualization

INTRODUCTION

With the development of human society, interior design has also evolved significantly, serving as an integral part of human life (Grieze and Miíelsone, 2021; Hasti and Kusnia, 2019). Interior design and human lifestyles support each other in tandem with societal progress (Chen and Wang, 2020). It is the outcome of people's practical needs and aspirations (Tautkute, 2019).Interior design is a broad discipline encompassing various elements, including building decoration materials (Cao, 2021; Zeng and Jiang, 2018), indoor furniture (Viyanon, 2017; Sarkar and Bardhan, 2019) and decoration styles. It is a dynamic, multidisciplinary field that merges artistic expression with technical proficiency, striving to create aesthetically appealing and functional spaces (Cai, 2023). This includes elements such as color schemes, furniture arrangement, lighting, materials and decorative accessories, all working together to create a harmonious and inviting environment.

The integration of artificial intelligence (AI) in architectural and interior design is becoming more important for keeping competitive in the worldwide market. This is due to fast changing consumer tastes and technical breakthroughs (Rane, 2023; Noaman, 2023; Li, 2021). From residential homes to commercial establishments, interior decoration plays a pivotal role in shaping ambiance and enhancing the quality of life for occupants. Creativity serves as the foundation for innovation and enriching the artistic expression of decorative materials offers limitless possibilities for spatial artistic conception (Jianzhong, 2013). Successful interior design relies on thorough planning, precise execution and meticulous monitoring until the project is completed (Hamid *et al*., 2018). Guiding the aesthetic direction of design enhances artistic expression, allowing for the conveyance of aesthetic characteristics, artistic concepts and atmospheric effects in interior spaces (Junwen, 2015). Recent technological advancements have revolutionized

How to cite this Article: Komal, Chahal, Promila Krishna, Renu and Poonia, Yanu (2025). AI Tools in Interior Decoration: Features, Strengths and Limitations. *Internat. J. Appl. Home Sci.,* **12** (3 & 4) : 175-179.

interior design, introducing innovative tools and techniques that enhance the creative process. Visual tools, including sketches, digital software and 3D modeling, allow designers to graphically represent ideas and concepts. These tools streamline the design process by facilitating communication between designers, clients and stakeholders. The emergence of virtual reality (VR) has further advanced interior decoration by immersing users in realistic environments before physical implementation. AI-powered digital rendering software, such as AutoCAD, SketchUp and 3ds Max, enables designers to produce photorealistic visualizations, experiment with layouts and explore various materials and color schemes before making final decisions. Interior decoration is both an art and a science, balancing aesthetics, functionality and comfort to create healthy and conducive living environments (Wang *et al*., 2019). The thoughtful use of color can transform the ambiance of a space, evoke emotions and enhance overall aesthetic experiences (Enwin *et al*., 2023). Color psychology plays a crucial role in influencing mood and behavior, allowing designers to craft spaces that evoke tranquility, energy, or warmth (Gokcakan, 2016; Jaglarz, 2023). Research has shown that warm colors such as red, orange and yellow evoke warmth and vibrancy, while cool tones like blue, green and purple create a calming effect. Light and neutral colors can make a space feel larger and open, while darker tones add depth and sophistication (Gokcakan, 2016). Cultural associations also shape color perception, influencing design choices across different regions and traditions. As technology continues to evolve, Artificial Intelligence (AI) has emerged as a transformative tool in interior decoration (Sadat, 2011). AI streamlines design processes, making them more efficient, dynamic and personalized. One of AI's most significant contributions is in wall design, where it helps designers experiment with diverse color palettes, textures and patterns to create sophisticated interiors (Lee *et al*., 2023). AI technology is increasingly shaping modern interior design, enabling professionals to optimize spatial arrangements, refine color selections and enhance material choices. AI is expected to continue transforming the industry, with its applications growing from 2023 to 2032 (Puri, 2023).

Review of Literature:

Meng *et al.* (2018) presented the development of an interior decoration design system integrated with AI capabilities using Unreal Engine 4 (UE4). The system features functions such as scene selection, house type drawing, furniture placement, material conversion and light control, operated through mouse clicks and keyboard commands. Additionally, AI modules assist in picture recognition for texture training, improving the system's ability to generate ideal textures. Limitations were found, particularly in the accuracy of house drawing functionality, where walls may not align seamlessly and the limited variety of available materials.

Süvari and Buldaç (2018) assessed the use of digital technology in relation to the creative thinking process in Interior Design education. For this purpose, the effects of digital technologies on the creative design development process in interior design education were examined through student experiences. Fourth grade students (39 people) in Interior Design department of a state university located in the Central Anatolia Region in Turkey are the participants of the study. Identification of participants; being volunteer to attend; taking the basic design / art education, computer-aided design and final interior design project courses. According to the findings, it has been detected that students use digital technologies for research on internet, technical drawings in computer, making 3D visualizations and preparing documents with text-image support. As results enhance design alternatives, improve the quality of interior design and ease the design intervention are the positive consequences of the use of digital technology. Not to benefit from the positive effects of hand drawing and the use of ready-made materials to destroy the original design are the negative consequences of the use of digital technology.

Sarkar *et al.* (2019) explained that by adding and modifying interior architectural components and their associated design factors, such as dividing wall, chef and furniture arrangement, a variety of interior layouts for both space-restricted tenement flats were constructed. The project began with the installation of in-situ sensors and a simulation-based framework that included random samples parametric modeling, CFD simulation and inter optimization. Air velocity, humidity and pollutant concentrations were explored as surrogates for IEQ. The research resulted in the development of two distinct home interior layouts using optimized design features that would ensure indoor environmental quality within the comfortable range so over breathing zone during natural ventilation settings.

Lafta and Hussein (2022) Studied on new vision of the interior design in Pune. Communication and upgrading

are linked to a set of expressive systems that are represented by information and opinion obtained through communication in order to obtain a design product that satisfies the human physical, psychological and health needs through cognitive and cognitive mechanisms that are enhanced by aesthetic organization and significance for intellectual and design advancement for the better using contemporary and innovative materials and techniques that reflect a new vision of the interior design.

Bangwal *et al.* (2023) highlighted that AI-generated designs were often more diverse and innovative compared to traditional methods, demonstrating how AI can push the boundaries of design possibilities.

Lee *et al.* (2023) explored AI's role in color analysis and its ability to optimize color palettes based on user preferences and environmental factors, including lighting, room size and even cultural significance. These studies illustrated how AI is not just a tool for automation but an enabler of creativity and personalization in interior design.

Comparative Analysis (Table 1 and Table 2):

Table 1 : Feature Comparison Table

Application	Core AI Technology	Visual Rendering Quality	Ease of Use	Style Customization	Product Integration	Professional Features	Pricing Model
Planner 5D	AI for layout optimization	High	Medium	Moderate	Limited	Basic	Freemium
Home-styler	Deep learning, collaborative filtering	Very High	Medium	High	Extensive	Advanced	Freemium
Interior AI	GANs, style transfer	Very High	High	Extensive	Moderate	Limited	Subscription
Roomvo	Computer vision, material mapping	High (surfaces)	Very High	Limited	Extensive	Moderate	B2B Licensing
Modsy	Computer vision, style ML	Excellent	Medium	High	Extensive	Advanced	Service-based
Havenly	ML recommendation systems	High (via designers)	High	High	Extensive	Limited	Service-based
Foyr Neo	Deep learning, ray-tracing	Excellent	Low	Extensive	Moderate	Professional	Subscription
Room GPT	Generative AI, GPT models	High	Very High	Moderate	Limited	Limited	Freemium
Collov AI	Visual search, NLP	Medium	High	Moderate	Extensive	Limited	Freemium
Décor Matters	AR + ML	Medium	High	Moderate	Moderate	Limited	Freemium

Table 2 : Strengths and Limitations

Application	Strengths	Limitations
Planner 5D	Accessible floor planning, cross-platform support	Limited style intelligence, basic rendering
Home-styler	Comprehensive toolset, excellent rendering	Steeper learning curve, resource-intensive
Interior AI	Quick style visualization, high-quality outputs	Limited layout modification, requires good input images
Roomvo	Unmatched surface visualization accuracy	Focused primarily on flooring/walls, limited full-room design
Modsy	Professional-quality output, shopping integration	Higher cost, longer turnaround time
Havenly	Human expertise with AI assistance, complete service	Service-oriented model, less DIY capability
Foyr Neo	Professional-grade tools, comprehensive features	Significant learning curve, higher cost
Room GPT	Instant transformation, simple interface	Limited customization, inconsistent results with complex rooms
Collov AI	Strong product discovery, style matching	Less comprehensive room design capabilities
Décor Matters	Mobile-friendly, social features	Limited professional tools, mobile constraints

Challenges of AI in Interior Design:

Artificial intelligence in interior design comes with its set of challenges and ethical considerations, as summarized in Figure 1. AI technologies pose challenges to fair treatment, transparency and ethical implications in algorithmic decision-making (Mittelstadt, 2016; Russo, 2023; Salwei, 2022). The development of AI in interior design is growing and is likely to increase. Now, it is therefore essential to direct the implementation of the ethical and equitable design process in order to stay away from the negative consequences on humans and society at large. The other set of challenges is on the understanding of the socio-technical systems of AI use in the interior design field. A socio technical approach will be necessary for effective handling of the challenges of the use of AI in interior design (Endsley, 2022; Van, 2018).

Reliance on Data Quality:

The accuracy and effectiveness of AI-driven interior design depend heavily on the quality and diversity of data it processes. Incomplete or biased datasets can lead to uninspired and inaccurate design recommendations, necessitating continuous refinement and updates.

Limited Creative Intuition:

Despite its efficiency, AI lacks the intuitive creativity of human designers. Since it relies on pre-existing patterns and algorithms, it may produce repetitive or formulaic designs, struggling to capture the uniqueness and emotional depth that a human touch brings to a space.

Challenges in Customization:

Although AI can generate personalized designs, it may struggle with highly specific or complex client requirements. Its algorithmic nature often lacks the adaptability needed for intricate design preferences, requiring manual adjustments to achieve the desired outcome.

High Initial Investment:

Implementing AI-powered design tools involves substantial upfront costs for software, training and infrastructure. This can be a barrier for small businesses and independent designers, limiting accessibility despite AI's long-term advantages.

Ethical and Privacy Concerns:

Many AI design tools rely on personal data to provide tailored solutions, raising concerns about privacy and ethical use. Ensuring compliance with data protection regulations and maintaining client confidentiality is crucial when integrating AI into design workflows.

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