Human Factors in Design, Engineering, and Computing, Vol. 238, 2026, 744–750
https://doi.org/10.54941/ahfe1008306

SENSEHOME: Supporting Emotion-Driven Interior Design Decisions Through Color Psychology and Augmented Reality

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ABSTRACT

Residential interior design is shaped not only by functional and visual considerations, but also by the emotional atmosphere users seek to create in their living spaces. However, many digital interior design tools remain primarily product- and visualization-oriented, offering limited support for translating desired feelings into concrete choices of color, material, furniture, and spatial arrangement. Drawing on research in color psychology, this study explores how color–emotion associations can be integrated with augmented reality (AR) to support emotion-driven decision-making in residential interior design. A literature-informed design approach was adopted to translate color–affect research into design cues for organizing alternative color directions within the prototype. Based on this foundation, SENSEHOME was developed as an AR-supported interior design prototype that connects users' affective intentions with color palettes, material choices, furnishing alternatives, and situated visualization. The workflow connects open-ended affective input with multiple color-informed design directions, iterative refinement, and situated AR comparison. Users can begin by expressing a desired spatial feeling in their own words or by exploring visual starting points, then develop and compare alternative design interpretations through the workflow. The resulting prototype is presented as a human-centered design proposition for affective decision support, with affective intention positioned as the starting point for design exploration rather than as a consideration added after product selection. This work reframes AR-assisted interior design from product visualization toward affective design support and provides a basis for future user studies on preference articulation, atmosphere–design alignment, and decision confidence.

Keywords: Affective design, Augmented reality, Color psychology, Human-centered design, Interior design

INTRODUCTION

Residential interior design involves translating diverse user requirements into concrete choices concerning spatial configuration, color, material, and furnishings. This translation can be difficult when users have limited design knowledge or cannot clearly articulate their needs, a problem that has also been identified in user-centered residential design research (Zhang et al., 2023). The challenge is particularly relevant when requirements are expressed in experiential terms rather than technical specifications—for example, when

Received September 12, 2026; Revised October 20, 2026; Accepted October 29, 2026; Available online December 1, 2026

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users describe a desired space as calm, warm, or comfortable. Prior work in mood-focused design has identified mood as a design objective (Peng et al., 2023), providing a precedent for considering a desired atmosphere as an input to design exploration.

Color provides one possible bridge between affective descriptions and spatial design alternatives. Research has identified recurring relationships between color and affective concepts (Jonauskaite and Mohr, 2025). However, color–emotion knowledge alone does not determine which design solution is appropriate for a particular user or space. Immersive visualization offers a complementary capability by allowing design alternatives to be examined in relation to spatial context (Lee et al., 2023).

Together, these studies support three elements relevant to SENSEHOME: color can provide affective cues, user requirements can be structured to inform design decisions, and immersive visualization can support contextual comparison. This study brings these elements together around a different starting point: the atmosphere that a non-professional user wishes to create. To investigate this approach, we develop SENSEHOME, an AR-supported interior design prototype that puts this logic into practice. The work presents SENSEHOME as a human-centered design proposition: a workflow linking affective intention articulation, design exploration, and situated AR comparison.

BACKGROUND AND RELATED WORK

Color–Emotion Associations in Interior Design

Color provides a practical visual cue for connecting affective intentions with interior design exploration. A recent systematic review found recurring color–emotion correspondences across a large body of psychological research, while emphasizing that these associations are generally many-to-many rather than fixed mappings (Jonauskaite and Mohr, 2025). Research in immersive interior environments further indicates that different color conditions can influence users' subjective responses (Cha et al., 2020). These findings support using color to inform atmosphere-oriented design exploration while presenting multiple design directions rather than fixed emotional prescriptions.

Affective Requirements in Residential Design

Non-professional users may find it difficult to translate subjective or experiential needs into concrete design choices. Residential design research has similarly identified difficulties in articulating actual user needs and shown that user requirements can be treated as structured inputs to design decision-support processes (Zhang et al., 2023). In this study, affective intention refers to the atmosphere a user wishes to create—such as calmness, warmth, or comfort. The relevant design challenge is therefore to support the transition from such an experiential requirement to understandable and revisable design alternatives without requiring users to express their needs in professional design terms.

AR for Situated Design Comparison

AR and related immersive visualization provide a means to examine design alternatives in relation to the spaces in which they will be used. Lee et al. (2023) demonstrated the applicability of an augmented virtual reality approach for comparing interior remodeling alternatives within a spatial context, illustrating how immersive visualization can support user-engaged design. In a mobile-commerce context, AR-based product presentation was perceived as more helpful for product evaluation than conventional 2D presentation (Tarafdar et al., 2024). These findings support using AR primarily as a focused comparison tool, allowing users to examine and revise design alternatives within a spatial context rather than as isolated images or products.

Together, these studies inform three elements of the SENSEHOME workflow: affective intentions can serve as inputs to design exploration, color can inform multiple atmosphere-oriented design directions, and AR can support comparison of those directions within a spatial context. The following section translates these elements into the design approach and interaction structure of the prototype.

DESIGN RATIONALE AND WORKFLOW

Color-Informed Translation of Affective Intentions

SENSEHOME does not require users to select from a fixed set of predefined atmosphere categories. Instead, users may either describe a desired spatial feeling in their own words or begin from an open-ended visual starting point. Color–affect research is used as a design reference for translating these inputs into several possible color-informed directions rather than into a single prescribed solution.

Table 1: Color–affect cues for SENSEHOME design translation (synthesized from Cha et al., 2020; Jonauskaite and Mohr, 2025; Ulusoy et al., 2020).

Color Factor	Literature-Supported Affective Relationships	Use in SENSEHOME
Hue	Different hue families show recurring affective associations. Blue, green, and blue–green are more frequently associated with positive low-arousal affect, while yellow and orange recur with positive high-arousal affect. Hue also plays a strong role in warm–cool perception.	Provides alternative hue and warm–cool directions in response to an affective starting point.
Lightness	Light colors are more frequently associated with positive affect, while residential studies also link higher-value colors with qualities such as pleasantness, comfort, and elegance.	Adjusts the overall light–dark character of alternative palettes rather than relying on hue alone.
Saturation	Higher saturation is more frequently associated with higher arousal, while residential studies report that lower-chroma colors are more frequently associated with discreet, pleasant, comfortable, or elegant meanings.	Varies the visual intensity of palette alternatives and helps distinguish more restrained from more vivid interpretations.

The translation draws on recurring relationships between affective concepts and color properties identified in prior research. These correspondences are generally many-to-many and vary with hue, lightness, and saturation (Jonauskaite and Mohr, 2025), while residential color meanings can also vary with value, chroma, and interior context (Ulusoy et al., 2020). SENSEHOME therefore treats these relationships as reference cues rather than deterministic mappings. Table 1 summarizes the color-related cues used to organize palette alternatives in the prototype. These cues are considered in combination and in relation to interior context rather than as independent or fixed prescriptions.

Design Considerations and SENSEHOME Workflow

Building on the color–affect cues described above, SENSEHOME was organized around three design considerations. First, affective intention should be treated as an open input to design exploration rather than reduced to a fixed set of predefined atmosphere categories. Users may articulate a desired spatial feeling directly or begin from visual inspiration, depending on how they prefer to explore.

Second, affective input should support exploration rather than prescribe a single design outcome. SENSEHOME therefore uses color–affect cues to inform multiple design directions, allowing different interpretations of the same starting point to remain visible and revisable.

Third, design alternatives should be considered in relation to spatial context. AR is therefore positioned as a means of examining and comparing developed alternatives in spatially situated views rather than as an isolated product-visualization feature.

These considerations define the overall workflow shown in Figure 1, which connects affective input, color-informed exploration, design refinement, and situated comparison as an iterative decision-making process.

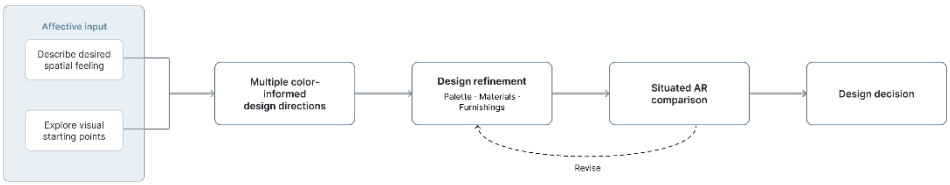


Figure 1: SENSEHOME workflow.

PROTOTYPE DESIGN

Affective Input and Design Exploration

The Explore interface provides two ways to begin a design exploration. Users may describe a desired spatial feeling in their own words through the prompt "How would you like your space to feel?" or select Explore ideas to browse visual starting points such as Calm and airy, Cozy and intimate, Bold and dramatic, and Bright and playful. These examples serve as optional starting points rather than fixed atmosphere categories. Both routes enter

the same exploration process while preserving their source: free-text entries retain the user's original wording, whereas the browsing route retains the selected starting point (Figure 2).

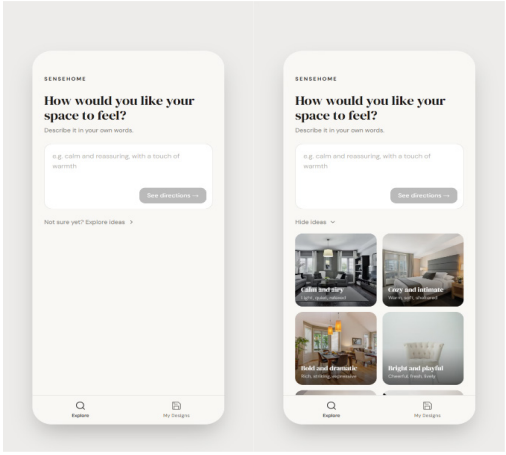


Figure 2: Affective input and exploration in SENSEHOME.

Color-Informed Directions and Refinement

For each starting point, SENSEHOME presents three coordinated design directions rather than a single recommended solution. Each direction combines a room preview, color palette, descriptive qualities, and an optional "Why this direction?" explanation. After selecting a direction, users can refine it through Palette, Materials, and Furnishings. Palette is foregrounded as the primary control, while material and furnishing alternatives support further development of the selected direction. The current combination remains summarized in the interface before the user proceeds to AR, keeping the design revisable rather than treating the initial direction as a fixed outcome (Figure 3).

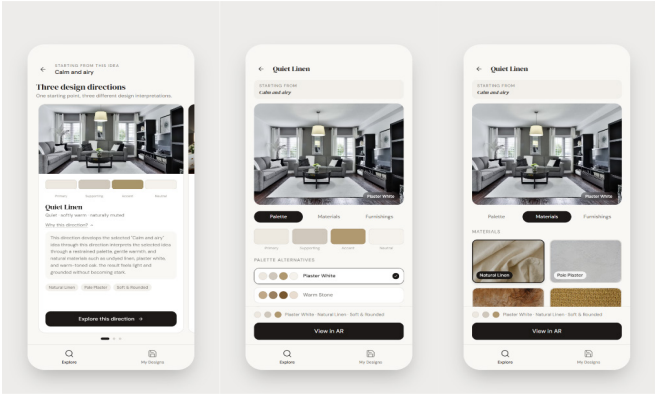


Figure 3: Design directions and refinement in SENSEHOME.

Situated AR Comparison and Saved Designs

After refinement, users can enter the AR view to examine design alternatives in a spatial setting, switch among available directions, or compare two alternatives through a split-view mode. Designs can be saved directly from the AR experience and collected in My Designs, where users can revisit saved alternatives and continue refinement. My Designs therefore functions as a persistent design library rather than as a separate final stage of the workflow (Figure 4).

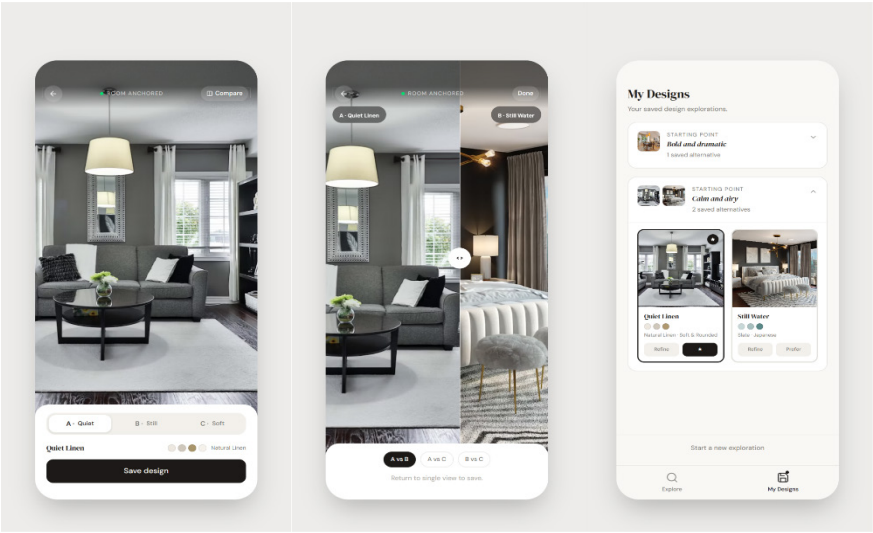


Figure 4: AR comparison and saved designs in SENSEHOME.

DISCUSSION

SENSEHOME reframes residential interior design exploration around the affective quality a user wishes to create rather than around the initial selection of products, colors, or materials. This starting point is particularly relevant for non-professional users, whose requirements may be expressed through experiential descriptions rather than professional design terminology. By supporting both free expression and visual exploration, the prototype treats affective intention as an open design input while allowing users to enter the process in different ways.

Color psychology is used within this workflow as a source of design guidance rather than as a prescriptive translation mechanism. Because color–affect relationships are many-to-many and context-dependent, SENSEHOME presents several color-informed design directions instead of assigning a single palette to a given affective starting point. The role of these alternatives is therefore not to identify a "correct" emotional solution, but to make the user's starting point more concrete and open to further refinement through palette, material, and furnishing choices. This approach keeps color guidance visible in the design process while leaving room for interpretation and user revision.

AR extends this process by allowing developed alternatives to be considered in a spatially situated view before a design is saved or revisited. In the current prototype, AR is treated primarily as a comparison and decision-support mechanism rather than as a technological contribution in itself. The present study remains exploratory and presents SENSEHOME as a literature-informed design proposition. It has not yet empirically evaluated whether the proposed workflow improves preference articulation, atmosphere–design alignment, or decision confidence. Future work should therefore examine how users interpret the presented design directions, whether these directions adequately reflect their intended spatial qualities, and how situated comparison influences subsequent design decisions.

CONCLUSION

This study presented SENSEHOME, an AR-supported interior design prototype that places affective intention at the beginning of residential design exploration. The proposed workflow connects open-ended affective input with color-informed design directions, iterative refinement, and situated AR comparison, and is designed to support the transition from an initially subjective spatial intention toward more concrete design alternatives. Rather than treating color–affect knowledge as a fixed prescription, SENSEHOME uses it to support multiple possible interpretations that remain open to user revision. The prototype provides a basis for further investigation of how affective intentions can be articulated, developed into design alternatives, and compared in spatial context. Future evaluation will examine preference articulation, atmosphere–design alignment, and decision confidence.

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