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Adaptive Interior Design as an Intelligent Environmental Mediator Between Users and Changing Climate

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Abstract:

The surrounding natural environment has become a critical factor in the design process, as climate change now demands respect through strategies that develop interior spaces capable of adapting to both user needs and environmental conditions. This research explores the role of adaptive interior design as an effective mediator in mitigating climate impacts, through the integration of smart technologies and responsive systems that interact with environmental stimuli such as heat, lighting, occupancy, and CO_2 levels.

The study highlights a direct relationship between interior design and climate change—greater reliance on non-renewable energy sources without sustainability strategies leads to increased environmental degradation. At the same time, climate change has driven the emergence of environmentally conscious and adaptive design trends. A mixed-methods approach was adopted, combining theoretical analysis of sustainability concepts, biophilic interaction, Internet of Things (IoT) applications, and human-computer interaction (HCI), with applied case studies including the Italian Pavilion at Expo 2025 Osaka and a smart penthouse in Maadi, Cairo. An electronic survey was also conducted, which revealed a high level of user awareness and willingness to adopt smart, sustainable solutions despite limited practical implementation. The study recommends integrating intelligent systems into interior design from early planning stages. It emphasizes that the use of sensors and smart technologies is no longer a luxury or a sign of wealth—it is an urgent necessity for contributing to the reduction of climate change impact

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