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Origamic Forms: A New Realm in Improving Acoustical Environment

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Abstract : The adaptation of architecture design to building function is getting highly needed in contemporary designs, especially with the great progression in design methods and tools. This, in turn, requires great flexibility in design strategies, as well as a wider spectrum of space settings to achieve the required environment that special activities imply. Acoustics is an essential factor influencing cognitive acts and behavior as well as, on the extreme end, the physical well-being inside a space. The complexity of this constrain is fueled up by the extended geometric dimensions of multipurpose halls, making acoustic adequateness a great concern that could not easily be achieved for each purpose. To achieve a performance oriented acoustic environment, various parametric shaped false ceilings based on origami folded notion are simulated. These parametric origami shapes are able to fold and unfold forming an interactive structure that changes the mutual acoustic environment according to the geometric shapes' position and its changing exposed surface areas. The mobility of the facets in the origami surface can stretch up the range from a complete plain surface to an unfolded element where a considerable amount of absorption is added to the space. The behavior of the parametric origami shapes are being modeled employing a ray tracing computer simulation package for various shapes topology. The conclusion shows a great variation in the acoustical performance due to the variation in folding faces of the origami surfaces, which cause different reflections and consequently large variations in decay curves.

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