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Parametric Models of Facade Designs of High-Rise Residential Buildings

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Abstract : High-rise residential buildings have become the most mainstream housing pattern in the world's metropolises under the current trend of urbanization. The facades of high-rise buildings are essential elements of the urban landscape. The skins of these facades are important media between the interior and exterior of high- rise buildings. It not only connects between users and environments, but also plays an important functional and aesthetic role. This research involves a study of skins of high-rise residential buildings using the methodology of shape grammar to find out the rules which determine the combinations of the facade patterns and analyze the patterns' parameters using software Grasshopper. We chose a number of facades of high-rise residential buildings as source to discover the underlying rules and concepts of the generation of facade skins. This research also provides the rules that influence the composition of facade skins. The items of the facade skins, such as windows, balconies, walls, sun visors and metal grilles are treated as elements in the system of facade skins. The compositions of these elements will be categorized and described by logical rules; and the types of high-rise building facade skins will be modelled by Grasshopper. Then a variety of analyzed patterns can also be applied on other facade skins through this parametric mechanism. Using these patterns established in the models, researchers can analyze each single item to do more detail tests and architects can apply each of these items to construct their facades for other buildings through various combinations and permutations. The goal of these models is to develop a mechanism to generate prototypes in order to facilitate generation of various facade skins.

Keywords : facade skin, grasshopper, high-rise residential building, shape grammar
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