PERFORMANCE-DRIVEN FAÇADE SYSTEMS

Parametric design for ultra-thin buildings in Hong Kong

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1. Introduction

This research project seeks to investigate how contemporary aspects of computation and performance are integrated into the design, fabrication and construction of façades for super thin, residential buildings. The project also seeks to develop new strategies to adjust Hong Kong building codes to create design outcomes with better performance in terms of energy consumption, manufacturability, domestic use and aesthetics.

Much of Hong Kong’s housing stock is highly repetitive as developers and architects are forced to conform to standardized building codes and compelled to make a profit in a region with extremely high land prices. This project uses digital parametric modelling tools to reconsider Hong Kong developers’ typical approach to programming, massing, and the static conformity of typical building facades (Figure 1).

Figure 1. Window apertures are shaped by vertical and horizontal attractors
Through design research, analysis and modeling, the project seeks to distort the standardizing forces of building code limitations, economic concerns and the Fordist approach to mass production on the built environment. Using rule-based digital tools, the project develops and tests proposals that yield more responsive, better integrated, architectural prototypes. Rhinoceros and Grasshopper modelling platforms are used to adjust an array of differently sized bay windows to control vertical and horizontal directionality.

The research is innovative in that it focuses on the facades of residential high rise buildings (which make up a significant portion of the built environment of Hong Kong) and proposes a new, super thin building typology. The project explores the challenges and limitations of living in Hong Kong’s minimally sized spaces by producing a linear apartment for a single individual. By packing life’s quotidian activities into an unusually thin strip, the project pushes the design of a domestic environment to a spatial extreme (Figure 2).

In the prototype, spaces for living, dining, cooking, bathing and sleeping are strung out in a linear array of micro-rooms. Domestic activities are pushed into projecting window volumes that position the occupant precariously between a residential interior and the city outside. Window units are sized and oriented in response to each domestic activity and are angled and inflected inwards and outwards to adjust for privacy or views. Room types can be sequenced differently on each floor according to the desires of the occupants. Units are stacked on top of each other to create a building that may be attached to the blank party walls of industrial or commercial buildings to take advantage of highly valuable, under-utilized space in the city.

Figure 2: Parametrically designed windows stack to form a thin residential tower