



PolyU Design

PhD

THESIS SERIES

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A Computational Kernel for Supporting Generative
and Evolutionary Design

2008

PhD

1999–2020 THESIS SHOWCASE

Many conventional studies on evolutionary design do not support multiple representations of design objects at different abstraction levels, which are essential for exploring design solutions incrementally and evolutionarily. To overcome this, a computational kernel based on a Generative and Evolutionary Design (GED) model is developed to establish design supporting system applications. This study focuses on three crucial aspects of this kernel: 1) modelling design object and design process in a generative and evolutionary manner within an integrated computational platform; 2) adapting and capturing the knowledge of how design objects are generated within this platform; and 3) enhancing the exploration ability of generative and evolutionary design applications with the use of several different evolutionary and generative computing techniques. Three examples of applying the GED kernel to design tasks are tested and evaluated. The results suggest adopting the kernel as the core architecture of computational design systems to support generative and evolutionary design applications, with improved generative, explorative, and adaptive ability to produce potential design solutions effectively and efficiently.

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PhD 2020.

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