PolyU Design

PhD

THESIS SERIES

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The Development of Parametric Shape Grammars
Integrated with an Interactive Evolutionary System
for Supporting Product Design Exploration

2007

PhD

1999–2020 THESIS SHOWCASE

This thesis describes the development of an interactive system that uses parametric 2D and 3D shape grammars which incorporate an evolutionary algorithm for exploring product forms at the early stage of the design process. To enhance the generative capability of shape grammars to support product design, this research focuses on two issues: 1) the development of a systematic approach to the formulation of shape grammars combining 2D and 3D forms; and 2) extending the generative capability of product design support systems which use shape grammars. This study argues that shape grammar rules modified by the genetic code scripts of an evolutionary method define a new combination of shape features for alternative designs. The research methodology reported in this thesis follows the analytical study of shape grammars and product forms with the development of new computational representations for the integration of evolutionary methods with shape grammars. The results conclude the applicability of shape grammars for real product design and indicate several strategies with which this research can be further advanced for complex design and visualisation in product design.