Aesthetic Principles in Generative Design

Generatively designed chair (left) and mechanical part (right).

Generative design (i.e. topology optimization) is widely recognized as an important design method for digital fabrication. By using sophisticated numerical analysis and optimization algorithms, it automatically creates mechanical parts with the maximum stiffness whilst consuming the least amount of material, i.e. being lightweight. Besides the quantifiable superiority in mechanical performance, the perceived elegance of the optimized parts also contributes to the increasing deployment of generative design in industries, including healthcare, architecture, automotive and aerospace. This perceived elegance, however, is difficult to quantify, and there exist no principles to guide the generative design process in order to maximize its aesthetic appreciation.

By adjusting some parameters in the topology optimization program, it can generate a large number of different designs. These designs are mechanically comparable, but visually very distinct. A practice in the use of topology optimization is to first generate dozens of designs (if not hundreds or even thousands of them), and let the designer to select the final one based on her/his aesthetic sensitivity. This selection process is labor-intensive and subjective.

Jointly supervised by experts in product aesthetics and generative design, your assignment is to investigate the aesthetic principles in generative design. We would like to identify the principles underlying the selection process in using generative design program, and relate the selection process by known aesthetic principles such as unity-in-variety and maximum-effect-for-minimum-means. This project involves (generative) design, 3d printing, and user study.

Supervisory team

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