



The Open University

Form Generation in Design

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Abstract

Computer-aided design was originally proposed as a replacement for drawing, and later as a replacement for model-making, yet sketching remains the medium of choice for designers to generate the initial form of their designs with. The continued employment of sketching in professional design, however, suggests that our understanding of how designers use their geometrical representations is incomplete.

A series of protocols was undertaken to address this lack of understanding, to uncover how designers generate the three-dimensional form of a design from their initial two-dimensional representations. By viewing the designers who participated in the protocols *and* their design representations as a distributed cognitive system, and employing a computational description of their representation making actions, it is possible to infer and describe the visual and spatial reasoning they employ.

The findings which emerge from this description are that the constructability constraints of a three-dimensional design representation, rather than the material constraints of the intended outcome, can be a source of emergent shapes and, furthermore, that there is no obvious disparity between drawing and making in terms of their generative potential.

This suggests that, as drawing a representation of a three-dimensional object in a two-dimensional space is necessarily a *dis*-integration of that form, integrating these two-dimensional representations in a three-dimensional space at an early stage can lead to more satisfactorily realised three-dimensional outcomes.

The findings from the enquiry make contributions to the theoretical knowledge of how three-dimensional forms are generated, how designers manage the transition from two dimensions to three, and of the gap that often exists between the implicit perceptual space and the explicit transformational space their representations occupy. They also raise questions about the position of sketching in design, and the validity of the divisions placed between generation and development in the use of sketching and other three-dimensional design representations.

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The work will teach you how to do it

- Estonian proverb

