

An Ontological Inquiry into the Role and Meaning of Geometry in Engineering Design

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Engineering design is a creative process that turns ideas into reality. It is a collaborative work of designers and engineers, who not only need to apply their knowledge and inventiveness to create new products and solve the technical problems but should also adapt these solutions to fulfil the expectations of their clients and to meet certain restrictions (material, technology, environment, economy, etc.).

According to the classic book by Pahl and Beitz “*Engineering Design. A Systematic Approach*” the product development process can be divided into four phases: task clarification, conceptual design, embodiment design and detail design. The latter two are not only well understood but also well aided with computer-based technologies (e.g. Computer-Aided Design or Computer-Aided Manufacturing). Moreover, these tools are continuously improved to meet the needs of the industry.

During the conceptual design phase, after clarification of the task, engineers must identify the essential problems of the product, establish function structures, search for adequate working principles and try to merge these into a working structure to find a principle solution. Designers here are not equipped with advanced technology and still need to depend on hand drawing, diagrams, matrices and other techniques.

In this research, I will concentrate on methodologies and techniques for the advancement in the area of conceptual design. In particular, I aim to provide a better understanding of the role and meaning that geometry has in the product design cycle by analyzing some real examples. In my view, this will lead to the introduction of the notion of ‘*context*’ and ‘*role*’ into the CAD and CAM systems. I am not focusing here on geometry as a mathematical theory but on the geometrical representation that carries meaning. In that sense, geometry intersects all stages of the product design.