

## Editorial

# Advances in Conceptual Design Theories, Methodologies, and Applications

**Dongxing Cao,<sup>1</sup> Shengfeng Qin,<sup>2</sup> and Yu-Shen Liu<sup>3</sup>**

*School of Mechanical Engineering, Hebei University of Technology, Tianjin , China*

*Department of Design, Northumbria University, Newcastle upon Tyne NE ST, UK*

*School of Software, Tsinghua University, Beijing , China*

Correspondence should be addressed to Dongxing Cao; [dongxingcao@gmail.com](mailto:dongxingcao@gmail.com)

Received November ; Accepted November

Copyright © Dongxing Cao et al. is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Conceptual design lies in the early stage of a complex product development process, requiring not only considering the product's function and structure but also its social and environmental impacts. The design and decision made at the conceptual design stage have a significant influence on the success of the product development. Thus, exploring advanced conceptual design theories and methodologies and their applications has been considered as an important stage of a new product development, and it is currently a hot research topic in the engineering design field. The existing design methodologies have achieved extensive applications in engineering design, such as axiomatic design, collaborative design, agent-based design, and fused design. Computer-aided design is widely seen as an enabling technology for supporting the scheme evaluation, geometric modeling, and structural feature design of new product development. Furthermore, within the industry engineering areas, there are strong commercial drivers to reuse and extend existing methodologies. Sometimes they are often undertaken in a highly coupled manner for a specific product design. However, as the complexity of product system and the diversity of product functions increase, the need for advanced design methods and tools becomes stronger. Therefore, conceptual design, as a rapidly changing field, developing new and advanced theories and methodologies dedicated to product innovation is required.

This special issue of *Advances in Mechanical Engineering* is dedicated to exploring the conceptual design theories, methodologies, and applications. We invite investigators

from different countries and regions to contribute to this special issue with the original research articles as well as the review articles on engineering design.

This issue aims to stress the importance of using conceptual design and advances in the conceptual design theories.

This special issue contains thirteen papers dealing with theories, methodologies, and applications of conceptual design in mechanical engineering. We hope that it is valuable to readers for their own research work.

The papers in this issue represent multifaceted contributions as well as the availability and usability of conceptual design in new product development. These taxonomies, including theories, methodologies, and their applications, are differentiated. A brief overview of each paper as follows.

Firstly, R. Gaha et al. presented a literature review of different works based on feature technology to ecodesign products in their paper "Ecodesigning with CAD Features: analysis and proposals". Environment has become an important factor for product design, especially for a kind of devices of producing gas against environment. They divide ecodesign into two parts. The first one concerns CAD-Life Cycle Assessment, such as methodologies, prototype tools, and the second one implements feature technology to reduce the environmental impact of one life cycle stage, such as material selection and manufacturing.

Secondly, advanced conceptual design theories are proposed by these research papers. The first paper by Y. and Chakrabarti "Physical realizations: transforming into physical embodiments of concepts in the design of mechanical





