Collaborative design new methodologies and technologies (Special issue)

Weidong, L.; Shen, W.

Publisher's version / Version de l'éditeur:
https://doi.org/10.1016/j.compind.2008.07.002
Computers in Industry, 59, 9, pp. 853-854, 2008-12-01

Editorial: special issue on collaborative design new methodologies and technologies

NRCC-50519

Weidong, L.; Shen, W.

December 2008

A version of this document is published in / Une version de ce document se trouve dans:
Computers in Industry, v. 59, no. 9, 2008, .pp 853-854

Special Issue on

Collaborative Design: New Methodologies and Technologies

Editorial

Collaborative design is one of the modern philosophies to reengineer the traditional product design processes. It is motivated by globalization and the trend of establishing inter-enterprise design chains through leveraging globally available resources. Collaborative design provides promising solutions to integrate geographically dispersed designers, design systems, resources and services together and make them inter-operate in an Internet/Intranet environment beyond the boundaries of physical and time zones. Due to the complexity of the technical requirements and applications, there are a number of research challenges to be resolved. For example, advanced communication strategies are necessary as higher and more complex demands create the need to integrate new and customized collaborative design systems and to enable designers to cooperate with each other. It is also imperative to develop robust and flexible collaborative strategies to meet the requirements of customized multi-disciplinary design organization and flow control, and to address the design conflicts and co-ordination. Meanwhile, collaborative design is the natural extension of concurrent engineering, and new system architectures are required to integrate collaborative design and concurrent engineering seamlessly in order to provide design and manufacturing services for effective design validation and optimization.

To accelerate the successful establishment of collaborative design, research in the areas has been actively carried out based on the rapid advancement of software technologies and the latest Internet standards and protocols. This special issue aims at updating and sharing the latest developments and results in the related areas. It consists of eight papers, which are based on the 11th International Conference on CSCW in Design (CSCWD 2007) held in Melbourne, Australia, on April 26-28, 2007 as well as an open call-for-papers. The papers cover important topics and issues of collaborative design, such as tangible interaction, 3D streaming, collaborative feature modeling, conflict management, design information and knowledge sharing, flexible system architectures and frameworks, and applications.

The first paper by Shen et al. presents comprehensive retrospective and perspective for Computer Supported Collaborative Design (CSCD) methodologies and technologies. It provides a review of the R&D literature on CSCD, from the pre-CSCD technologies of the 1980's to today's CSCD state-of-the-art. CSCD research challenges and opportunities are also discussed and highlighted.

The second paper by Chu et al. presents a method of 3D streaming for collaborative design in a networked environment. A CAD model is decomposed and transmitted in multiple levels of detail (LODs) to optimize information sharing. It provides a useful mechanism that improves the efficiency, effectiveness, as well as security of sharing large CAD files over the network.

The third paper by Li et al. proposes a feature granularity concurrency control approach for replicated co-design systems. This approach supports simultaneous design operations in the collaborative feature modelling, and avoids performance bottlenecks on a centralized server. It is implemented in a real-time co-design environment consisting of multiple heterogeneous CAD systems, which proves the feasibility of the proposed approach for potential industrial applications.

The fourth paper by Ouertani discusses a critical element of collaborative design, i.e., managing design conflicts as well as the resulting impact once the conflicts are resolved. The concept of data dependencies network to assess the impact on product data is developed. Key issues with regards to concurrent engineering to better manage design processes are quantified. Findings and recommendations to optimise the process re-organisation are summarized.

The fifth paper by Gao et al. introduces a TDM (Total Data Model) centered framework to support both time and space consistency maintenance of hybrid CAD applications. A conflict detection algorithm is developed and a prototype system is implemented to prove the validity, efficiency and feasibility of the proposed framework.

The sixth paper by Zha et al. depicts a hybrid decision support model within a multi-agent framework. The hybrid model integrates the compromise decision support problem technique (cDSP) and the fuzzy synthetic decision model (FSD). It quantitatively incorporates qualitative design knowledge and preferences of designers for multiple and conflicting attributes stored in a knowledge repository so that a better understanding of the consequences of design decisions can be achieved from a more comprehensive perspective.

The seventh paper by Kuk et al. provides an integrated engineering environment to support design, modelling, and simulation activities in the product development process. The framework is built on the basis of a number of advanced technologies, such as Service-Oriented Architecture, intelligent software agents, and Web Services.

The eighth paper by Sheremetov et al. describes an approach to developing a framework for detailed engineering automation based on an integrated concurrent and collaborative engineering model. An example of pipe networks design and stress analysis in the upstream or downstream petroleum industry is given. Engineering tools are integrated through a multi-agent system for helping stress analysis engineers identify problems and suggesting available solutions on pipeline layout based on historical cases.

Finally, we would like to thank all the authors and the reviewers who have made significant contributions and efforts to the preparation and edition of this special issue.

Weidong Li
Faculty of Engineering and Computing
Coventry University
Coventry, U.K.

Weiming Shen
National Research Council Canada
London, Ontario, Canada