EDITORIAL OF THE SPECIAL ISSUE ON COMPUTER SUPPORTED COOPERATIVE WORK IN DESIGN

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Design of complex artifacts and systems requires the cooperation of multidisciplinary design teams using various commercial and non-commercial engineering tools such as CAD/CAE tools, modeling, simulation and optimization software, engineering databases, and knowledge-based systems. Individuals or individual groups of multidisciplinary design teams usually work in parallel and separately with various engineering tools, which are located on different sites, often for quite a long time. At any moment, individual members may be working on different versions of a design or viewing the design from various perspectives, at different levels of details (Shen et al., 2001).

In order to meet these requirements, it is necessary to have efficient collaborative design environments. These environments should not only automate individual tasks, in the manner of traditional computer-aided engineering tools, but also enable individual members to communicate with each other, share information and knowledge, collaborate and coordinate their activities within the context of related design projects. Computer Supported Cooperative Work (CSCW) in Design is concerned with the development of such environments and related technologies.

A series of international workshops and conferences on CSCW in Design started in 1996. These workshops and conferences have attracted several hundreds of researchers from a number of closely related research communities including Design, CSCW and Groupware, Software Agents, Distributed Objects, Knowledge Management, Databases, Virtual Environments, Workflow Management, and e-Learning. The previous workshops/conferences were held in Beijing (1996), Bangkok (1997), Tokyo (1998), Compiègne, France (1999), Hong Kong (2000), and London, Ontario (2001).

This special issue is based on the Seventh International Conference on Computer Supported Cooperative Work in Design held on Sept. 25-27, 2002 in Rio de Janeiro, Brazil. The 9 articles included in this special issue are the extended version of 9 papers presented at the conference (Shen et al., 2002). These 9 articles report on different aspects of CSCW in Design.

The first article, by Enembreck and Barthès, describes how Personal Assistant Agents can be used to improve computer supported cooperative work and to support knowledge management. It presents a Personal Assistant Agent (PA) using domain knowledge to help a user in a collaborative environment. A PA communicates with other PAs to exchange information about users and about how they solve problems. Therefore, one user can benefit from other users' experiences. The proposed PAs are used in an educational environment to assist remote groups of students working on a collaborative mechanical engineering design project.

The second article, by Cherkaoui et al., presents an agent based approach and a supporting data structure for the verification of constraints in a mechanical engineering design context. The data structure is composed of three levels: environment level providing a link to existing mechanical engineering software; expert level capturing product requirements through constraints formulation; and product level dealing with specific products under development. Constraints and models are assigned with distinctive attributes, which are then exploited by software agents in their verification strategies.

Multi-agent task planning provides an additional level of optimization for the operation of agents in their mission to check the product against the various constraints throughout the design process. The proposed approach was validated through a case study typical to the aerospace industry.

The third article, by Chao et al., presents an agent based architecture for integrating different design systems. Software design agents from various disciplines are used to explore the design problem and solution space. The most interesting contribution of this work is in its multiple-evolutionary approach with an automated negotiation mechanism to enable agents to exchange design solutions and to reach an agreed optimized solution for a global design problem.

The fourth article, by Younas et al., proposes a multi-agent transaction model based on extended transaction models and agent technologies. The novelty of this model is in its automatic customization of transactions according to requirements of design activities. The proposed model is formally specified using CCS (Calculus of Communicating Systems) language. The formalization is crucial in ensuring the correctness, reliability, and recovery of multi-agent transactions, given the complex and unreliable nature of distributed design activities. The model is to be implemented and validated through industrial case studies.

The fifth article, by Li et al., presents as an open data management facility called Collaboration Oriented Data Agent (CODA). It provides a proactive engineering data management service for collaborative design environments. The proposed approach focuses on combining agent technologies with project oriented data management to develop a CODA framework. The design and implementation issues are addressed in details. The framework has been tested in a distributed multidisciplinary design optimization environment.

The sixth article, by Barbosa et al., proposes a dynamic distributed object model as an enabling feature for distributed CAD to address the highly dynamic aspects of the design process in a collaborative design environment. The proposed approach allows project team members to work cooperatively, access and exchange information at run time in a distributed engineering environment. It also allows for the artifact properties to be associated with any relevant aspect of the design process, including those related to the artifact specification, the organization hierarchy, planning and process workflow. It has been tested through a number of industrial and academic case studies.

The seventh article, by Mi et al., introduces a feature based modeling service framework and proposes a feature interface model for a distributed modeling environment, including the support of remote feature attachment and semantic maintenance. A feature interface definition strategy using procedural attachment and declarative validation mechanism is described in details.

The eighth article, by Richards et al., presents the RECOCASE approach that provides collaborative requirements RECOnciliation through the use of a Computer Aided Software Engineering tool. One of its interesting features is to enter use case descriptions asynchronously in natural language by individuals. The tool can automatically produce a visual representation of the requirements to assist the group to identify and resolve conflicts and produce a representative requirements specification.

The ninth article, by Thouvenin et al., presents a real distributed collaborative design case study through an international collaborative design project. The most interesting result of this work is the experience and lessons learned on collaboration among design teams with different cultures (multi-culture aspect of collaborative product design). Another interesting result of the research is its separation of an ontology related to collaborative design from an ontology related to modeling.

References

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