

Chapter 11

Multiagent Based Product Data Communication System for Computer Supported Collaborative Design

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ABSTRACT

Today, designers and engineers on collaborative design environments often work in parallel and independently using different tools distributed at separate locations. Due to unique characteristic of engineering design, interaction during product development is difficult to maintain. As the information and communication technologies advance, computer supported collaborative design (CSCD) becomes more promising. Nevertheless, a potential problem remains between the product design and manufacturing, which primarily lies on the geometric shape of products that exists inherent in mass-customization. Meanwhile, each CAD/CAM technology has its own authoring tools, which govern the use of independent language and format for expressing various features and geometry. This condition creates incompatibility and has significant impact to the product costs. This chapter is to address the incompatibility problem by introducing the architecture of a multiagent-based product data communication system. The developed system is adaptive and has a capability for autonomous tracking of design changes. The tracking model is able to support forward and backward tracking of constraint violation during the collaborative design transactions.

BACKGROUND

Today's industry requires massive computer-supported technologies to address the increasingly complex product development tasks and the high expectations of customers. As the information and communication technologies advance, the application of collaborative engineering to product design, so-called computer supported collaborative design (CSCD), becomes more promising.

Sprow (1992) defines CSCD, or so-called cooperative design, as the process of designing a product through collaboration among multidisciplinary product developers associated with the entire product life cycle. CSCD is carried out not only among multidisciplinary product development teams within a company, but also across the boundaries of companies and time zones, with increased numbers of customers and suppliers involved in the process.

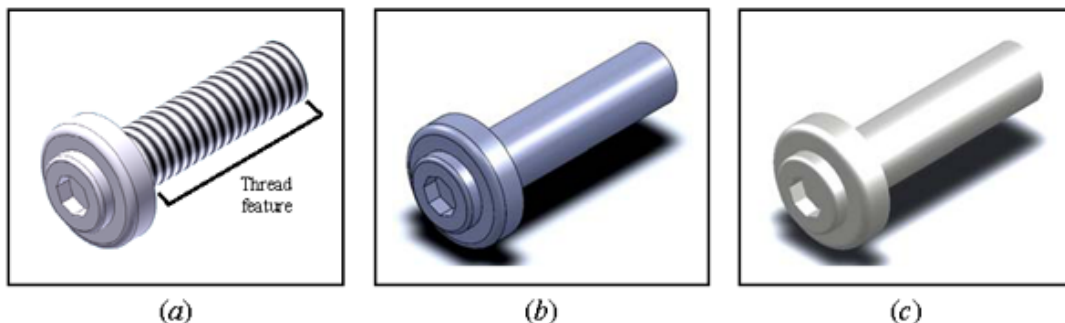
Accomplishing a design task and delivering the results to manufacturing requires immense and complex information. Currently, most CAD/CAM technologies govern independent authoring tools in different proprietary formats. Meanwhile, a potential problem between design and manufacturing remains in the geometric shape of products, which mainly exists inherent in mass-customization. For instance, creating 'thread' on a screw using the *thread* feature operation in the

Autodesk Inventor as depicted in Figure 1. This feature often cannot be recognized when the design is transferred and read using another CAD/CAM system (e.g., Solidworks). Or, in some cases it will be recognized with certain deviation of dimensions and tolerances. This condition creates incompatibility problem. Failures in the final design requires engineer to perform design rework, which has significant impact to the product costs. Furthermore, if failures are recognized after the design being manufactured, it will result in such condition the whole products to be rejected.

In collaborative design environment, the design – build – test cycle is performed by designers and engineers who work with various application systems in geographically distributed locations. When change is applied on a part, changing of shapes or dimensions will create constraints propagation to the adjacent parts that might affect the overall performance of the product. In this regard, the ability to tracking design changes becomes important. Therefore, the synchronization of product data communication along product development process is necessary to take place.

This chapter aims to address the incompatibility problem in the collaborative design environment. To support design exchange, a multiagent based product data communication system is introduced. The adaptive system is developed on the Cloud technology, where a shared server

Figure 1. Screw: (a) original design created by Autodesk Inventor; (b) original design read in Solidworks, (c) translated design to neutral file in Solidworks



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