Design of the Improved PDM and the Real-time Collaborative Viewing System

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ABSTRACT

This paper describes design methods of the improved PDM and the real-time collaborative viewer. The improved PDM system is designed based on UML. Database searching speed on the network and automatic creation of UI through the UI builder have been studied in this paper. The real-time collaborative viewer has been designed to eliminate network dependency. It reduces the cost of implementation and management of the system. As the developed system is lightweight, it runs on all types of networks from high-speed LANs to wireless connections. Collaborators can check dimension errors, human factors, form errors, as well as mark up the important parts and deliver messages of their views over the Internet. Functions of 2D and 3D data viewing, markup and annotation, dynamic sectioning, printing services, and real-time conferencing combined with the PDM render real-time benefits to reduce production time to market and design cost. The usefulness of the developed system is confirmed through case studies.

Keywords: Dimension PDM, UML, Real-time Collaboration, Viewing system, Dimension verification.

1. INTRODUCTION

PDM and collaborative viewing systems are indispensable for the current design and manufacturing environment. Many kinds of PDMs and viewers are being applied in the manufacturing industry. However, there are several limitations. Dassault System’s SMARTEAM [1] does not adopt standard UML in the design process. It is impossible to express multi-inheritance and to cope with various requirements of clients. MatrixOne PDM [2] supports multi-inheritance but it has difficulty to implement UI. In addition, most PDM systems drop their average searching speed when the data size is big. After relieving the reason of the low speed transmission as well as the drawbacks of the current PDMs, the improved PDM system has been developed for the fast transmission of data and convenient usage of the system.

For the collaborative viewers, Kan, et al. [3] have studied a real-time collaboration system for product design over the Internet environment by using Virtual Reality Modeling Language (VRML) and Java applet. Huang, et al. [4] have created a standard Internet based Design for X (DFX) shell that provides a framework in which many types of DFX tools can be operated. Chen, et al. [5] developed the Internet-enabled real-time collaborative assembly modeling system using Java RMI and STEP. However, there are following problems: (1) Those systems use the middleware such as CORBA. CORBA requires not only high performance hardwares but also is very expensive. (2) Since a lot of data are transmitted during the collaboration process, it is impossible to realize the real-time collaboration over the low speed network environment. (3) It is impossible to transmit information across the firewall installed in most companies. (4) Since the program to be installed in a client side is very large, it takes long time to execute the viewers.

To compensate for these drawbacks of the previous viewing systems, a real-time multi-viewer is developed on the open-architecture web server, Apache, in this paper. As the Apache is used for the viewer, it is inexpensive and does not require high-performance hardwares. In order to increase the data transmission capability, all transmission data are converted into parameters. This conversion reduces the transmission time and overcomes the network speed limitation. The developed system works well even over the low speed network environment. It runs on all types of networks such as high-speed LAN, dial-up modem, wireless connection and so on.

As the real-time viewing functions are constructed over the ActiveX control environment and the file size of the ActiveX control is light, client application for the design and dimension verification does not need to install the developed application software before using the system. Collaborators are able to perform real-time 2D and 3D viewing.