PRECISION DESIGN VERIFICATION SYSTEM OF INJECTION MOLDS USING WEB-BASED 3D VIEWING TECHNOLOGY

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ABSTRACT
An efficient and precision hybrid interference verification algorithm for the web-based interference verification system is studied for injection mold design processes. In order to design a collaborative system over the distributed environment, the proposed system uses lightweight CAD files produced from the optimally transformed CAD data through ACIS kernel and InterOp. This proposed system allows collaborative developers to verify interferences among parts over the Internet without any commercial CAD systems. The system gives benefits to collaborators by reducing production cost, errors and lead-time to the market. Validity of the developed system is confirmed through case studies.

KEYWORDS
Collaboration, Injection mold, Interference verification, Internet, Lightweight CAD file.

INTRODUCTION
Injection-mold industry is important for the human life. Demands for shorter design and manufacturing lead-time, good dimensional accuracy and quality, and rapid design changes have become significant issues in the injection mold design and manufacturing industries. In order to reduce lead-time in the production process of accurate molds, most companies use 3D CAD systems and attempt to apply design collaboration tools to the design process of molds. Communication difficulty between collaboration divisions or companies, loss of accurate inspection tools to verify designed molds, the file conversion difficulties among several CAD systems, etc. have increased the lead-time and decreased the production efficiency [1]. To overcome these problems, commercial web-based viewing tools, such as Spinfire of Actify Corporation and AutoView of Cimmetry system have been used. However, the commercial viewing tools have only simple measurement functions and do not have accurate interference verification functions applicable to injection mold design processes [2]. In addition, as they are general viewers, it is difficult to apply the viewers to the design process of injection molds.

In this paper, to design a precise viewer with accurate measurement functions, a web-based design verification system is studied through ActiveX control. To apply this system to the interference verification process of injection molds, a draft verification module [2] according to the parting surface is incorporated into the web-based precise measurement system. An optimized lightweight CAD file [3], produced from a commercial CAD file, is applied to overcome communication difficulties. In addition, assembly verification of injection molds is developed through the axis aligned bounding box tree [4] and the data structure of the lightweight CAD file [2].

Performance of the developed system is verified through various case studies over the Internet. Using the developed web-based 3D viewer, it is possible to reduce lead-time and manufacturing cost.

CLASSIFICATION OF INTERFERENCE PARTS IN INJECTION MOLDS
Interferences of injection molds primarily occur by slide cores, angle pins, ejector pins, bolts, etc. Interference of a slide core occurs at the curved surface between the slide and the lock. In this case, the slide core is not assembled well due to the interference. Fig. 1(a) shows an example of the interference between the slide and the lock. An angle pin is a locking unit that fixes a slide core to prevent interference between the product and the injection mold. Interference changes the length and the inclination angle of the angle pin.