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PROJECTS
Human Centered CAD Laboratory

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♦ Development of midsurface generation system from solid CAD model

Three-dimensional (3D) CAD systems have been widely used for product design and simultaneously, engineering analysis has been conducted as an integral part of product design for purposes such as the evaluation of material or physical properties, determination of feasibility for manufacture, and assessment of suitability as part of a product. Finite element analysis (FEA) is one of the most popular engineering analysis methods; this method requires a finite element mesh as a geometric input. This mesh can be generated directly from a solid model for the detailed part model designed in a 3D CAD system. However, such a detailed solid model is often too complex to analyze efficiently, and excessive computation time is required. Therefore, an appropriate idealization process including detail removal and dimension reduction is indispensable for FEA mesh models.

As shown in Figure, the mid-surface model of a thin-walled part is widely used for the simulation of the injection molding process for plastic parts or car crash tests for an auto-body comprising sheet metal and plastic parts. The mid-surface model is derived from a solid model of the part through the idealization process.
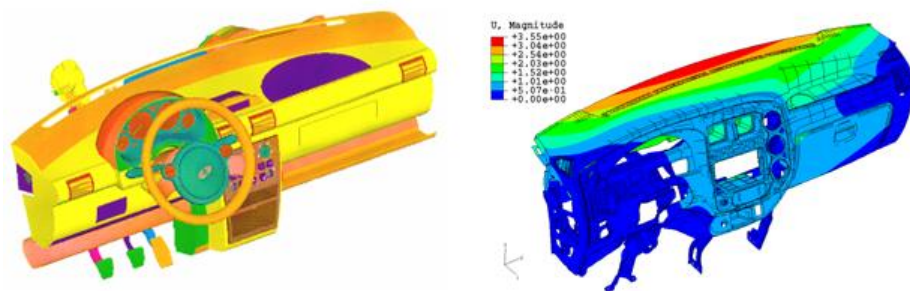
The goal of this project is to generate a simplified solid model which is suitable for analysis from the original complicated 3D CAD model. This simplification module is implemented using CAA development tool as a form of CATIA V5 Add-In. This module consists of three phase, Solid Simplification, Conversion to Surface, and Surface Simplification.

In Solid Simplification phase, the system detects small features such as fillet based on its design information, and remove. In this process, characteristics of fillet feature, i.e. radius, relationship with other features, and geometric profile of itself are considered as criteria of elimination.

After Solid Simplification phase, the system converts solid model to surface model by extracting all surfaces of solid. With this process, topologies of model will be removed, and then model can have more capabilities of easy modification and simplification.
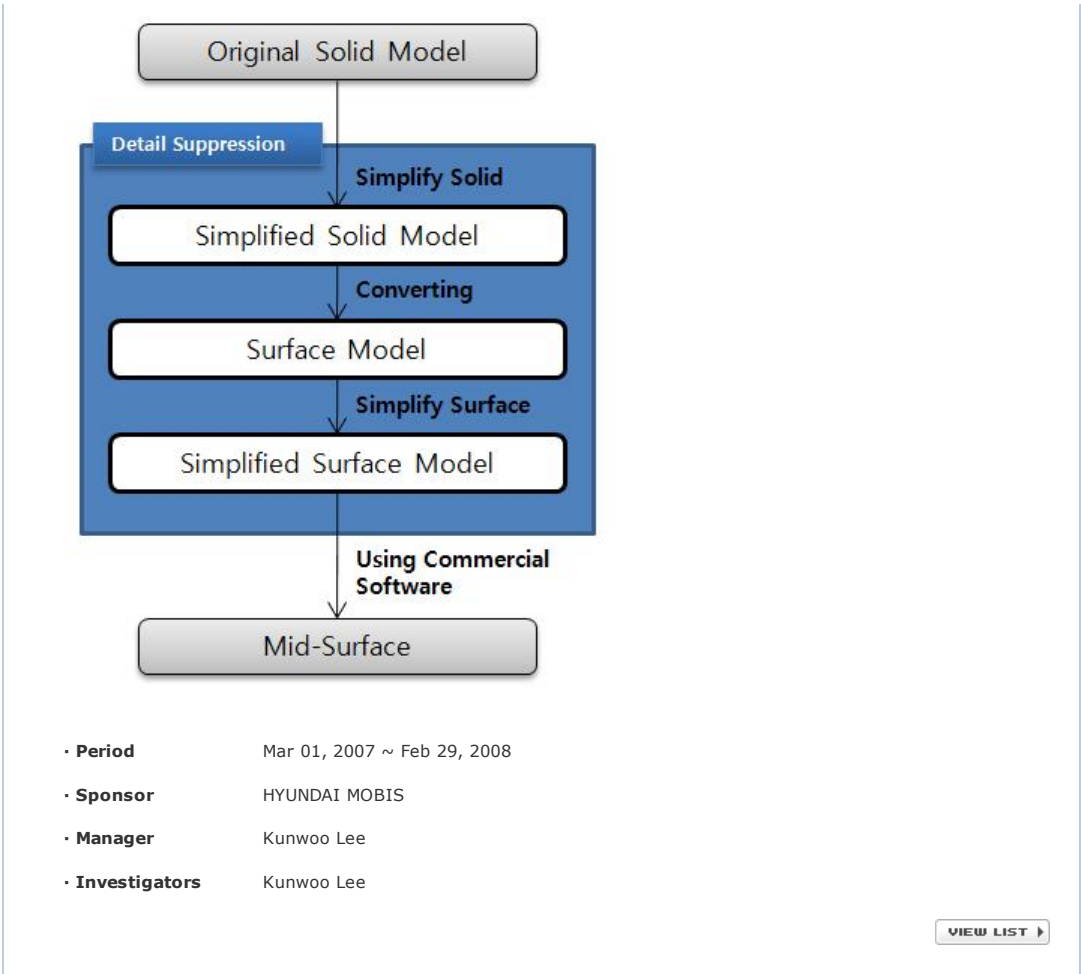
In Surface Simplification phase, user can perform manual simplification processes, with helpful UI (user interface) provided from our system.

After all of simplification process, the system export the resulting simplification surface model to commercial software (HyperMesh) and then finally Mid-surface model for analysis will be obtained.

Original Solid Model   Surface Model for Analysis

· **Period**	Mar 01, 2007 ~ Feb 29, 2008
· **Sponsor**	HYUNDAI MOBIS
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