

DEVELOPMENT OF AN EFFICIENT TOOL FOR MODELING PLASTIC PARTS USING MACHINE LEARNING

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Plastic parts in automobile, such as bumper fascia, grilles and covers, need to be represented precisely in a finite element model because they affect pedestrian protection and low speed collision performance. The plastic parts include some special features like clicks, dog-house bosses and ribs which make the structure's geometry complicated. Therefore, representing plastic parts in the model is difficult and hard to automate. Creating a model for plastic parts is currently being done manually using huge manpower.

A plug-in tool for ANSA was developed to reduce the modeling manpower for plastic parts. The unique feature of this tool is that it can recognize 13 families of different geometrical features automatically and apply an appropriate representational mesh for each feature family. During the implementation of Machine Learning, a total of approximately 100 thousand different data sets of features were prepared for the training as shown in Figure 1. Hierarchical learning based model was used to classify the images to the respective features. The hierarchical learning based model could classify unseen features, which were not used for the training, with an accuracy of 97% in the verification phase.

A currently used approach had difficulty in recognizing the features correctly when it had slightly different geometry such as slanting angles, lengths, and widths. On the other hand, this plug-in tool was able to have more flexibility for the recognition of new variants by installing the trained hierarchical learning based model.

Among several different geometrical features, this presentation mainly focuses on the introduction of this approach applied for the modeling of clicks as shown in Figure 2. It was found that modeling manpower has been reduced for clicks by 93% after the application of the tool.

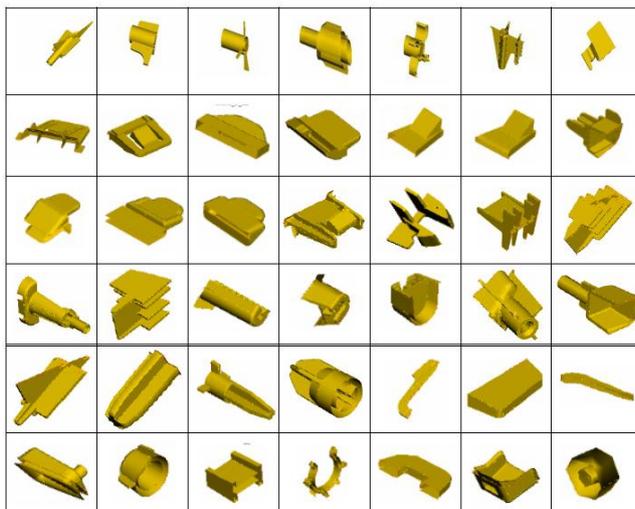


Figure 1 – Samples of Training Data set

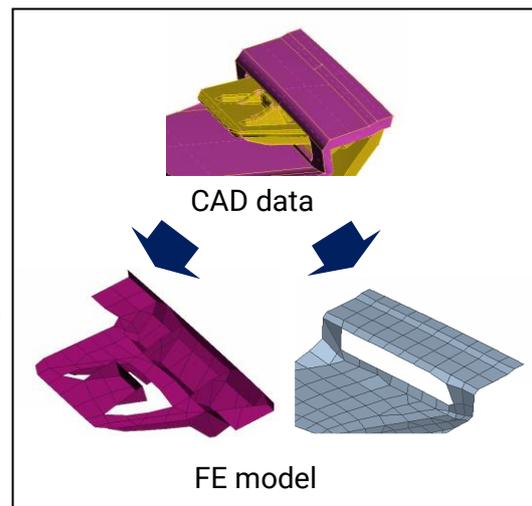


Figure 2 – Automated modeling for click