ABSTRACT

CAD Model Construction using Digital Images

Donghoon Lee

(Directed by Professor Seungjae Min, Ph.D.)
Department of Mechanical Design and Production Engineering
Graduate School
Hanyang University

Topology optimization is widely accepted as a conceptual design tool for the product design. Since the resulted layout of the topology optimization is a kind of digital images represented by the density distribution, the seamless process is required to transform digital images to the CAD model for the practical use

In this study, the general process to construct a CAD model is developed to apply for topology images based on elements as well as graphic images based on pixels. First, the shape of the configuration is extracted by converting gray images to binary images. For the graphic images, the brightness of pixel is the measure to assign binary value and for topology images, the evaluated density of a node is switched to a binary value based on the threshold value which satisfies the volume constraint. Second, the morphology

technique is adopted to extract boundary contour of the shape and remove the noise of images through erosion and dilation operation. Finally the smoothing algorithm to avoid zigzag line and provide fairness is applied to obtain a CAD model with smooth boundaries.

The proposed method automatically generates point data sets of the geometric model. The process is integrated with Pro/Engineer, one of commercial CAD systems, so that the engineer in practice can directly handle with curves or surface from digital images.