ABSTRACT

Topology Optimization of Structure
with Support Area Considerations

Youngjun Joo

(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 useful concept design tool. Since the design domain is described with the boundary conditions a prior, support area is not considered as design variables in topology optimization. The purpose of this study is to extend the design domain to the support area and to find out the optimal structure and support area simultaneously.

The support area is modeled by introducing a new design variable, density of a spring, and the optimal support area is controlled by varying the amount of material used in support area. As a result, the optimization problem is formulated as the nested optimization of the support area with optimal material distribution in the design domain.

The homogenization design method is used for finding out optimal structural topology and density method is applied for the optimal support area.

The result of some test problems shows that the amount of material used in the support area affects the configuration of the support area as well as the structural layout. It provides structural designers with some information on the optimal topology of the structure according to the different optimal support area.