Post Processing of Optimization Baesd on Truss-Like Material Model[1]

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Abstract

Accoding to Michell thoery, topological optimal structurs was truss-like continuum genrally, which was a kind of anisotropic non-uniform continuum.

In this paper, truss-like material distributed field was optimized by fully-stressed criterion, based on which truss-like structure was to established. Structures were analizyed by finite element method. The densities and orientation of material at nodes were taken as design variables. A serious of continuous lines were drawed acooding to the orientations of material at nodes in every element to form continuous polygonal lines. These lines were fixed by cubic parametric equations. Furtherly, these cubic equations were unified expressed by aid of some parameters. By choosing proper parameters, discrete truss with any number of members and perforated plate with any number of holes can be formed. The topological optimal structures were very close to analitical solution. Since no intermediate densities were suppressed in optimization procedure, there was no numerical instabilities.

A numerical example was shown in Fig. 1. Only 640 four-nodes rectangular elements were used. Topological optimal perforated plate with different number of holes and trusses with different number of members were showed in Fig. 2 and Fig. 3, respectively.

Based on the topological toptimal results, size optimization and shape optimization was needed furtherly before application in engineering.

Keywords: Topology Optimization, Truss-Like Material, Post Processing

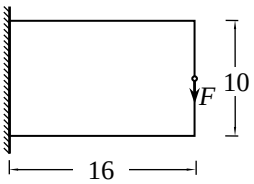

Fig.1 Mechanics

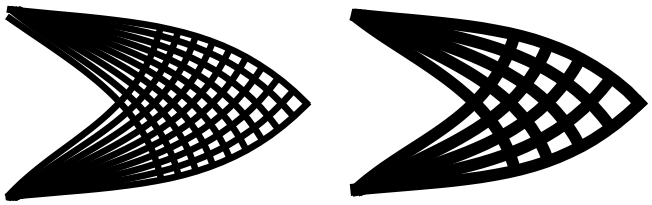

Fig.2 Topological optimal perforated plates

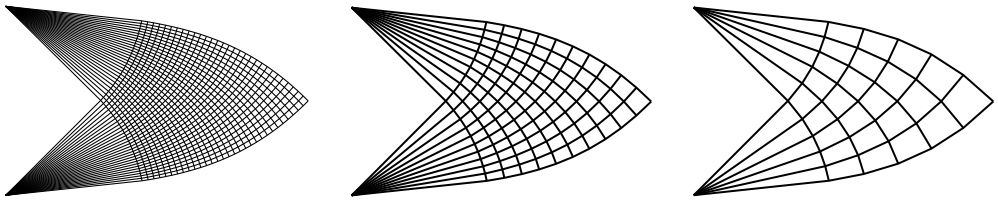

Fig.3 Topological optimal trusses

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