

Hole nucleation for level set based topology optimization by hard kill as BESO

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Abstract

A method is proposed to nucleate holes during the level based topology optimization by using the material removal scheme of the bi-directional evolutionary optimization (BESO). The key idea is that when a very small amount of inefficient material is removed according to the BESO from the interior of a structure, the effect is essentially the same as that of using the topological derivative to nucleate a hole. For removing material, a threshold of sensitivity number is determined. It is the minimum of two tentative thresholds. The first is determined according to the percentage of material to be removed in each iteration of optimization. The second is determined according to the average sensitivity number along the boundary to be optimized, and it is helpful to stabilize hole nucleation. Details of the optimization procedure is described. The results of several numerical examples prove that the proposed hole nucleation method is effective and efficient.

Keywords: hole nucleation; level set method; BESO; topology optimization