

DEVELOPMENT OF A MULTI-LAYERED MICROPOLAR ELASTIC MODEL FOR TOPOLOGY OPTIMIZATION OF LINK MECHANISMS

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Keywords: Topology optimization, Mechanism synthesis, Micropolar elasticity, Multi-layered model, Optimum design

Abstract

Synthesizing link mechanisms that achieve both desired motion and high rigidity is a challenging task, particularly when relying solely on a designer's intuition. Recently, researchers have explored various optimization techniques to assist in machine design. Among these, topology optimization is a powerful method that suggests optimal design concepts based on mathematical and physical principles. However, there are few existing examples where topology optimization has been applied specifically to link mechanism synthesis. To address this gap, we explored a topology optimization method for link mechanism synthesis. We introduced a mathematical model that approximates the behavior of link mechanisms while remaining compatible with topology optimization. A key challenge in link mechanisms—unlike the compliant mechanisms frequently studied in this field—is the presence of overlapping parts. To handle such structures, we introduced a multi-layered micropolar elastic model. This model consists of two elastic layers connected by springs, which are defined by an additional design variable. In this presentation, I will detail the definition and implementation of this two-layered model and the formulation of the corresponding topology optimization problem.