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Material Cloud Method for Topology Optimization

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A newly developed material cloud method (MCM) for topology optimization is presented to overcome some difficulties in widely used traditional density distribution method (DDM) and improve a numerical efficiency in topology optimization procedure. In MCM, an optimal structure can be found out through modifying sizes and positions of material clouds, which are lumps of material having specified properties. A numerical analysis for a specific distribution of material clouds is carried out using fixed background finite element meshes. Application methodologies in this MCM are broadly categorized as three. One is to optimize sizes of material clouds (MCMS). Other is to optimize positions of material clouds (MCMP). The third is to sequentially optimize positions and sizes of material clouds (MCMPS). In MCMS, convergence and final result of material distribution can be improved as against those of DDM. Through applying MCMPS, an optimal design, which is with clear material distribution in an enlarged domain, can be efficiently obtained.

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