Topology Optimization Driven by Mesh Adaptation

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ABSTRACT

Many applicative engineering fields such as aerospace, biomedical or automative, may benefit of recent techniques such as shape [1] and topology optimization to improve the performances of structural components with respect to reference paradigms.

In an aerospace context, topology optimization aims at properly distributing the mass of a satellite component within the design domain, in order to minimize, for instance, the mechanical or the thermal stress or the (static or dynamic) compliance.

3D printing-based productions, such as Additive Layer Manufacturing (ALM), can advantageously exploit these techniques where the material distribution plays an important role.

From a mathematical point of view, topology optimization requires solving partial differential equations (e.g., the linear elasticity equation or the heat equation), so that the selection of the computational mesh becomes a crucial issue to deliver reliable results at an acceptable computational cost.

In this communication, we present a new approach, which couples the SIMP algorithm [2] with a mesh adaptation procedure to devise an optimal computational mesh.

We investigate the benefits due to this approach by comparing the performances of the new method with the standard techniques available in commercial softwares, on classical benchmark cases as well as on aerospace components.

REFERENCES

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