INTERNSHIP PROPOSAL

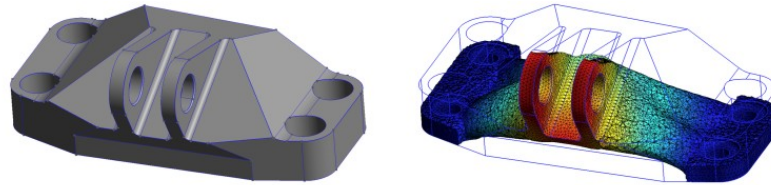## Topology Optimization with Adaptive ▯-shapes

Figure 1: Left: Initial design of a bracket. Right: Topological optimization with Morfeo software – Cenaero©
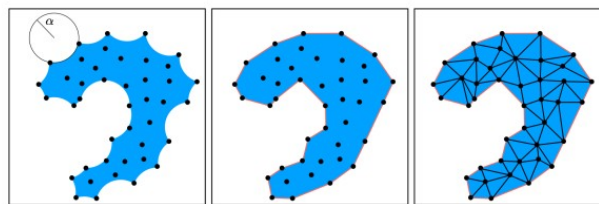

Figure 2: Left: α-hull of a point set. Center: corresponding α-shape. Right: Triangulation of the α-shape.

Topology optimization allows the creation of innovative designs by maximizing efficiency while simultaneously minimizing mass and complying with the limitations of industrial manufacturing. A fixed mesh usually discretizes the design space governing the topology, which is subject to a given physics. The granularity of this fixed mesh limits then the reachability of the optimal design.

α-shapes approximate the topology of a given point set with a simplicial mesh. This meshing technique naturally supports topology modifications for point sets evolving in space and time.

Pairing both methodologies then sounds promising, since meshing the design space with α-shapes would release the whole potential of topology optimization.

Objectives

Engaging with this challenge starts by connecting α-shapes of Gmsh API to an open-source project implementing topology optimization, e.g. DTU codes. This friendly prototype allows for addressing adversities and to analyze the performances of this novel approach. Upon successful pairing, proprietary Morfeo software integrates this unique technology.

Profile

- ***Required: Bachelor + ongoing Master's studies in Mechanical, Electromechanical, or Aeronautical Engineering or data science.***

- *Languages: English and/or French.*

- *Pre-requisites: notions of structural mechanics + programming (Python).*

- *Motivation, creativity and team spirit!*

Duration
The length of the internship can vary from 4 months to 6 months, depending on your university or school regulations.

Contact
Interested candidates should send a cover letter, quoting reference number of the offer, and a resume to
rh_be-ip-2024-008@cenaero.be