OPTIMAL DESIGNS WITH TOPOLOGY OPTIMISATION

Assignment
Develop a topology optimisation algorithm based on level-set methods that is able to interact with a finite element model and use it to find optimal designs for eigenfrequency maximisation.

Activities
- Develop a structural finite element model
- Implement a topology optimisation algorithm with a solver oriented to take eigenfrequencies as cost functions
- Development and testing of code for benchmarks and toy models
- Learn the theory and foundations behind topology optimisation, and compare the developed algorithm with alternative methods
- Apply the algorithm to a valuable industrial case

Context
Finding the most efficient design for complex structures is a challenging task of enormous industrial importance. Traditional approaches usually focus on simple and easy manufacturable geometries, and the best design is sought by varying a few parameters of an initial design concept. This type of approach explores only a small subset of design possibilities and limits the maximum achievable performance of the final design.

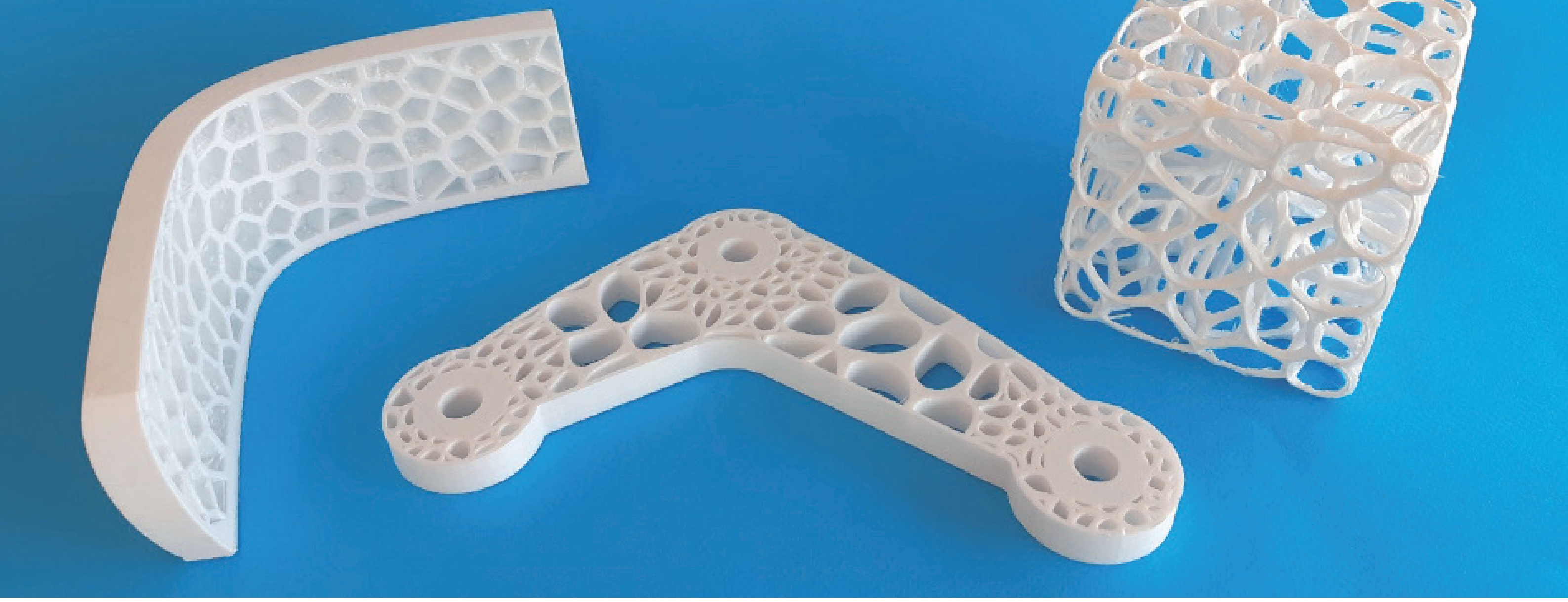
Internship overview
- Master Student
- Graduation
- Mathware
- Location: Eindhoven

Technologies
- Topology Optimisation
- Finite Element Analysis
- Design Optimisation
- Structural Mechanics

SIOUX TECHNOLOGIES

Sioux Technologies
Eindhoven | Nuenen | Mijdrecht | Delft

+31 (0)40 2677 100
jobs@sioux.eu
jobs.sioux.eu



Topology optimisation presents a radically different method that does not rely on predefined design choices but focusses instead on optimising a performance criterion and considering all possible designs that meet the physical and geometrical constraints. By adapting the material distribution on a fine mesh over successive FEM simulations, the best designs that maximise stiffness, minimise weight or reduce vibrations are found.

Due to the discreteness of the mesh elements, typical optimal designs display artificial “Lego brick” textures and jagged edges, and even blurry material-void interfaces for density based methods. To handle these issues, level set methods have been suggested as alternative methods providing smooth void-material interfaces. In these methods, the geometry of a structure is represented by a level set function, and its surface is sharply defined by the zero level contour, which discards the need for post-processing of optimal solutions.

Sioux is in the process of acquiring expertise in topology optimisation and developing algorithms to find the most efficient designs for industrial projects. A particularly important challenge is to find structural designs that reduce the impact of vibrations. When a structure is exposed to sudden accelerations, undesirable vibration modes can be excited. These vibration modes are intricately connected to the design geometry, and with topology optimisation we aim to find designs where vibration modes are damped quickly.

Why choose Sioux?

- Working on innovative technology
- Challenging, dynamic and varied work
- A comfortable and personal work environment
- Plenty of opportunities for personal development
- Great carreer opportunities
- Contributing to a safe, healthy and sustainable society

Get in touch!
Would you like to know more about this student assignment?

Contact:
João Machado; Timo van Opstal
+31 (0)40 751 61 16
werving_mathware@sioux.eu