TOPOLOGY OPTIMIZATION
IN CIVIL AND STRUCTURAL ENGINEERING

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ABSTRACT

A structural engineer is responsible for creating structures which can successfully transmit a given loading to potential supports. The ingenuity of structural engineers has led to the conception of outstanding civil engineering constructions such as gothic cathedrals and the Eiffel Tower. In the past one key concept used has been funicular theory. Vivid evidence of this theory being applied in practice can be seen in many beautiful structures (e.g. as outlined in the book *Shaping Structures: Statics* by MIT professors Wacław Zalewski and Edward Allen, 1998). However the same type of optimal designs can be achieved via truss topology optimisation methods (e.g. as described in *Optimization of Structural Topology, Shape, and Material* by Martin Bendsøe, 1995). Thus emerging structural optimisation techniques can be considered as rejuvenating and extending almost forgotten design methods.

The main aim of the Minisymposium is to gather together researchers interested in the development and application of structural topology and shape optimization techniques to the design of engineering structures. Papers on various topology optimisation formulations are welcome, e.g:
- continuum based numerical solutions for appropriately relaxed 2D and 3D models, including structures formed from shells and plates with transverse inhomogeneity
- approximate-discretized solutions using discrete members (*layout optimisation*)
- cross-fertilization between truss topology optimisation and computational limit analysis techniques (*e.g. discontinuity layout optimisation*)
- treating global buckling instability phenomena and transmissible loadings to facilitate form finding
- optimal design of concrete structures using fiber or conventional reinforcing elements and identification of the location of strengthening elements for existing structures (*retrofit design synthesis*)

Topology optimisation is potentially applicable across the full range of length scales, being of equal value in identifying the overall geometry of a proposed new building to suggesting microstructural details of a single component. This fascinating synthesis will lie at the heart of the Minisymposium.

Confirmed keynote lecturer: **Prof. George Rozvany**, editor-in-chief of *Structural and Multidisciplinary Optimization*, Budapest University of Technology and Economics.