



T. Sokół and T. Lewiński: Simply supported Michell trusses generated by a lateral point load. *Structural and Multidisciplinary Optimization*. (2016) 54:1209–1224, DOI 10.1007/s00158-016-1480-8

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Abstract:

The paper deals with the optimum design problem posed by George Rozvany: find the lightest fully stressed truss transmitting a given concentrated force to two supports forming a line parallel to the force. One of the supports is a hinge while the second one is a roller. The feasible domain is a square domain over the line linking the supports. The problem thus formulated belongs to the class of the three force problem, till now unsolved in general. In the problem stated here two of the three forces are mutually orthogonal. The family of solutions to this problem is parameterized by the coordinates of the point of the force application, hence is a two-parameter family. This seemingly simple problem generates a vast family of extremely interesting solutions, some of them being known, some being only partly resolved, while others turn out to be surprising and not resolved till now. The present paper delivers exact solutions to the optimum designs corresponding to the force position being a sufficiently big distance to the line linking the supports. The kinematic and static approaches are used, both leading to the same exact results. Other solutions are constructed numerically by the adaptive ground structure method.