K. Bolbotowski, L. He, M.Gilbert, Design of optimum grillages using layout optimization, Structural and Multidisciplinary Optimization,
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Abstract
Grillages are often used to form bridge decks and other constructions. However, following a period of intensive research activity in the 1970s, comparatively little attention has been paid to optimizing the layout of grillages in recent years. In this contribution a new numerical procedure is proposed which takes advantage of the adaptive solution scheme previously developed for truss layout optimization problems, enabling very large scale problems to be solved. A key benefit of the proposed numerical procedure is that it is completely general, and can therefore be applied to problems with arbitrary loading and boundary conditions. Also, unlike some previously proposed procedures, the sizes of individual beams can readily be discerned. To demonstrate its efficacy the numerical procedure is applied to a range of grillage layout design problems, including load dependent problems which could not be solved using traditional methods. It is shown that important phenomena such as “beam-weaves” can be faithfully captured and new high-precision numerical benchmark solutions are provided.