

Stadia Roofs, Gravity stressed cable nets – Matrix based form-finding based on fixed plan geometry

Corresponding AUTHOR, Tim C. R. FINLAY

*BuroHappold
Camden Mill, Bath, UK. BA2 3DQ
Tim.finlay@burohappold.com

Abstract

In recent years a number of gravity stressed cable net stadia roofs have been designed and delivered within BuroHappold. During this period an understanding of the structural behavior of these systems has developed along with a recognition that ‘live’ controlled form-finding can play a key role in collaboration during the design process.

This paper will chart the development of gravity stressed cable net stadia roofs from the transformation of the London Olympic Stadium, through the delivery of Education City stadium for the Qatar World Cup and on to the development of a parametric, matrix based design tool for form-finding of the system and its use in the development of design solutions for a Premiere League stadium.

The particular challenge of finding the 3D equilibrium geometry for a system where the geometry of the elements is fixed on plan (as might be dictated by the stadia bowl geometry or architectural requirement) will be described along with the non-iterative matrix based solution. The implementation of this solution within a parametric visual scripting environment (Grasshopper for Rhino) will be described

A selection of real design challenges will be explored parametrically using the design tool with an emphasis on the ability to control the plan geometry and to bring live parametric modelling into the design process.

Finally, an extension of the use of the tool to generate efficient geometries for internally stressed cable net systems will be presented.