A deployable tensegrity footbridge: static design and optimization

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Abstract

Tensegrity describes systems in which bars in compression seem to float inside cables in tension. This concept has inspired artists and designers for more than 60 years, however nowadays very few civil structures are built across the world. Although tensegrity structures seem visually light, there still remains a lack of rigorous and quantitative proofs about their structural efficiency in particular in terms of self-weight and stiffness. This article presents a 60m span tensegrity footbridge in steel composed of adapted simplex modules that contain one more cable than the classic simplex modules. The influence of this choice on the structural performances of the footbridge are here detailed. Eventually, the tensegrity footbridge is heavier and less stiff than traditional trusses but it is an aesthetic solution which offers the remarkable ability to deploy.

Keywords: self-weight; stiffness; optimization; deployment; footbridge; simplex; tensegrity;

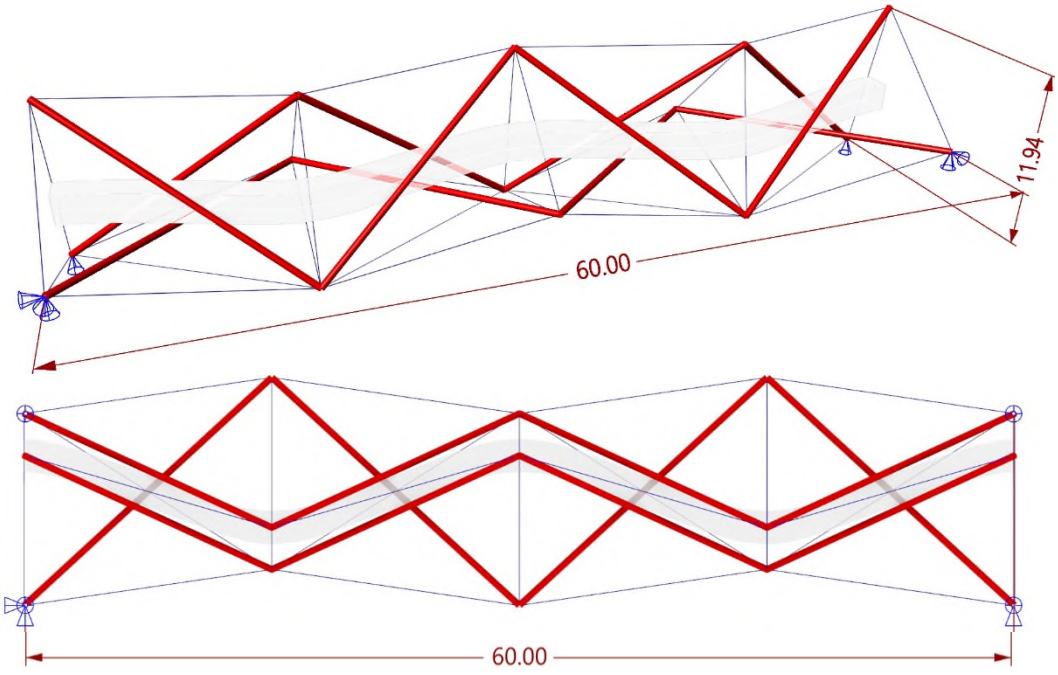

Figure 1. Perspective and top views with dimensions at scale of the optimized footbridge composed of adapted simplex modules. The 2mx2m grey parallelepiped shows the minimum clearance for pedestrians.

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