Superposed functions as Airy stress functions for form-finding of funicular shell structures

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Abstract
The design and optimization of funicular compression-only shells can be enabled by Airy stress functions. Previous work discretizes the Airy stress function, which is not often compatible with the nonuniform rational B-spline (NURBS) surfaces that designers typically utilize. A method to superimpose elementary mathematical functions into Airy stress functions to enable improved designer feedback relating to optimization of funicular compression-only shells is presented, determining stress functions directly through elementary mathematical functions [1]. This paper aims to broaden the design freedom allowed utilizing airy stress functions, thus alleviating the major cited limitation of this approach [2]. A library of mathematical functions is established, wherein each function is assigned a variety of parameters and weights. The superposition of these weighted functions results in a more flexible design space. This paper will describe a procedure to combine superpose mathematical functions into new Airy stress functions for greater diversity of compression-only forms.

Keywords: NURBS surface, Airy stress function, funicular shells, self-supporting surfaces