Objective

Prismatic Tensegrity Structure

Dihedral Symmetry

Self-equilibrated Configuration

Stability Properties

Connectivity

Configuration
Configuration $D_{n}^{h,v}$

The simplest prismatic tensegrity structure $D_{3}^{1,1}$
Dihedral Symmetry $D_{n}^{h,v}$

$E (C_{3}^{0})$

$C_{3}^{1}, C_{3}^{2}$

$C_{21}, C_{22}, C_{23}$

$D_{3}$ Symmetry
Connectivity of Horizontal Cables $\mathbf{D}^{h,v}_n$
Connectivity ? Vertical Cables $D_{n}^{h,v}$
\[ \mathbf{A} \mathbf{x}_0 = 0 \]

\[
\begin{aligned}
q_v &= -q_s \\
n_v / q_v &= \frac{\sqrt{2(1 - \cos(2v\pi / n))}}{(1 - \cos(2h\pi / n))}
\end{aligned}
\]

\[ \mathbf{x}_0 \rightarrow \mathbf{x}_1, \mathbf{x}_2, \ldots, \mathbf{x}_i, \ldots, \mathbf{x}_{2n-1} \]
Stability Criterion

\[ \mathbf{K} = \mathbf{K}_E + \mathbf{K}_G > 0 \]

infinite stiffness

\[ \mathbf{K}_E \to 0 \text{ or } \infty \]

\[ \mathbf{Q} = \mathbf{M}^T \mathbf{K}_G \mathbf{M} > 0 \]

\[ \tilde{\mathbf{Q}} = \begin{bmatrix} > 0 \\ > 0 \\ > 0 \end{bmatrix} \]
Stability

\[ h = 1 \quad \Rightarrow \quad K_G \geq 0 \quad \Rightarrow \quad Q > 0 \quad \Rightarrow \quad \text{Stable} \]

\[ h \neq 1 \quad \Rightarrow \quad K_G \neq 0 \quad \Rightarrow \quad Q \neq 0 \quad ? \]

\[ D_{8}^{1.1} \quad \text{Stable} \quad D_{8}^{1.2} \quad \text{Stable} \quad D_{8}^{1.3} \quad \text{Stable} \]

\[ D_{8}^{2.1} \quad \text{Unstable} \quad D_{8}^{2.2} \quad \text{Divisible} \quad D_{8}^{2.3} \quad \text{Conditionally Stable} \]
Divisible Structures

\[ D_{6}^{2,2} = D_{3}^{1,1} + D_{3}^{1,1} \]
Numerical Investigation

$D_8^{2,3}$

$D_8^{2,1}$

Graphs showing minimum eigenvalue versus height/radius for different conditions.
Please note in the paper that there are some mistakes on \( n, h \) and \( v \).
Summary

Prismatic Tensegrity Structure

Symmetry

Self-equilibrated Configuration

Stability

Divisibility

Connectivity

Horizontal Cable

Vertical Cable

Configuration

Height / Radius

http://tensegrity.AIStructure.com/prismatic