Tensegrity Geometry Derivation Results

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Six-strut Tensegrity
(corresponds to the tetrahedron-tetrahedron duality)

Lengths when strut length is 2:

$$d = \frac{4\sin^2(\phi) - 1 + \sqrt{1 + 8(1 - 2\sin^2(\phi))^2}}{4\cos(\phi)}$$

$$short = \sqrt{2}\sqrt{d^2 - d(\cos(\phi) + \sin(\phi)) - \cos(\phi)sin(\phi) + 1}$$

$$long = \sqrt{2}\sqrt{d^2 - d(\cos(\phi) - \sin(\phi)) + \cos(\phi)\sin(\phi) + 1}$$

Twelve-strut Tensegrity
(corresponds to the octrahedron-cube duality)

Lengths when strut length is 2:

$$d = \frac{\frac{\sqrt{2}}{2} - \sin(\phi)\cos(\phi) + \sqrt{4\sin^2(\phi)\cos^2(\phi) + \frac{1}{2}}}{\cos(\phi) + \sqrt{2}\sin(\phi)}$$

$$short = \sqrt{d^2 - 2\sqrt{2}\cos(\phi)d - \cos^2(\phi) + 3}$$

$$long = \sqrt{d^2 - 2\sin(\phi)d + \cos^2(\phi) + 1}$$