Some Mathematical Sculptures

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Figure 8 knot

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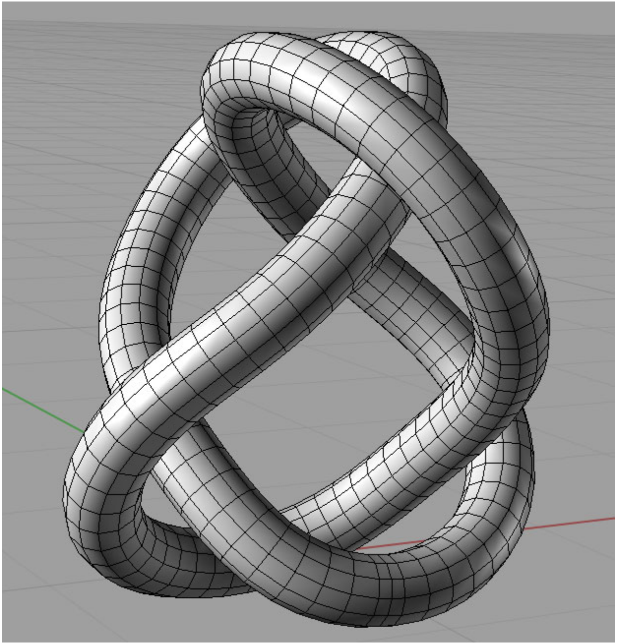
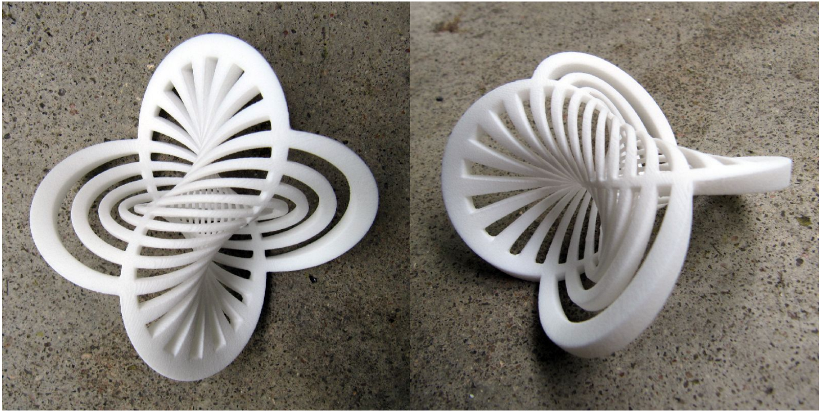


Archimedean Spire

Sphere Autologlyph

Hopf Fibration

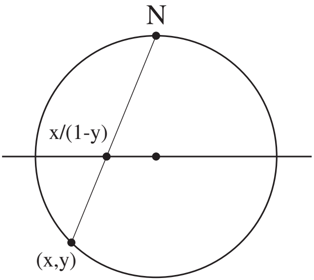


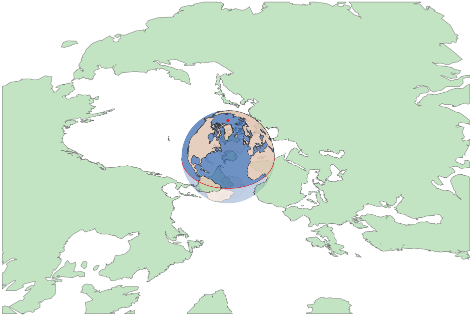
This sculpture really lives in $S^3 = \{(x, y, z, w) \in \mathbb{R}^4 \mid x^2 + y^2 + z^2 + w^2 = 1\}$. There is a very natural parameterisation of the torus in S^3, given by

$$\big(\cos(\theta)\cos(\phi), \cos(\theta)\sin(\phi), \sin(\theta)\cos(\phi), \sin(\theta)\sin(\phi)\big)$$

$$\text{for } 0 \leq \theta < 2\pi, 0 \leq \phi < \pi$$

Stereographic Projection





We can move things from S^n to $\mathbb{R}^n$ using stereographic projection, $p : S^n \to \mathbb{R}^n$, given by $p(x_0, x_1, \ldots, x_n) = \left(\frac{x_0}{1-x_n}, \frac{x_1}{1-x_n}, \ldots, \frac{x_{n-1}}{1-x_n}\right)$.

Round Möbius Strip

The Möbius Strip is parameterised as

$$\big(\cos(\theta)\cos(\phi), \cos(\theta)\sin(\phi), \sin(\theta)\cos(2\phi), \sin(\theta)\sin(2\phi)\big)$$

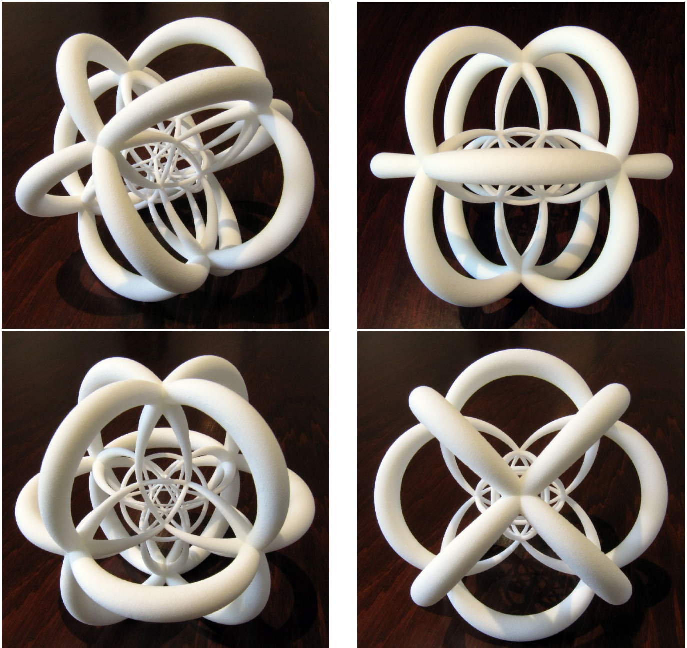
$$\text{for } 0 \leq \theta < \pi, 0 \leq \phi < \pi$$

Round Klein Bottle (two copies of the Möbius strip!)

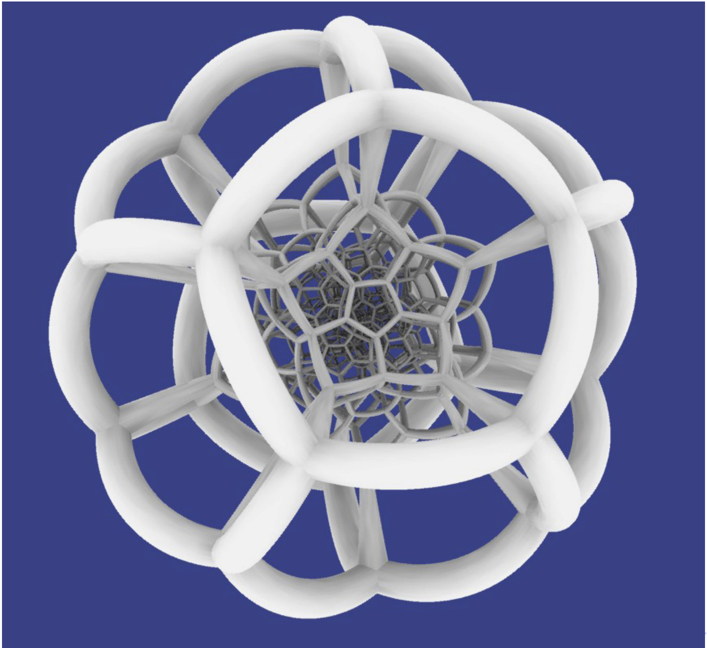



Knotted Cog

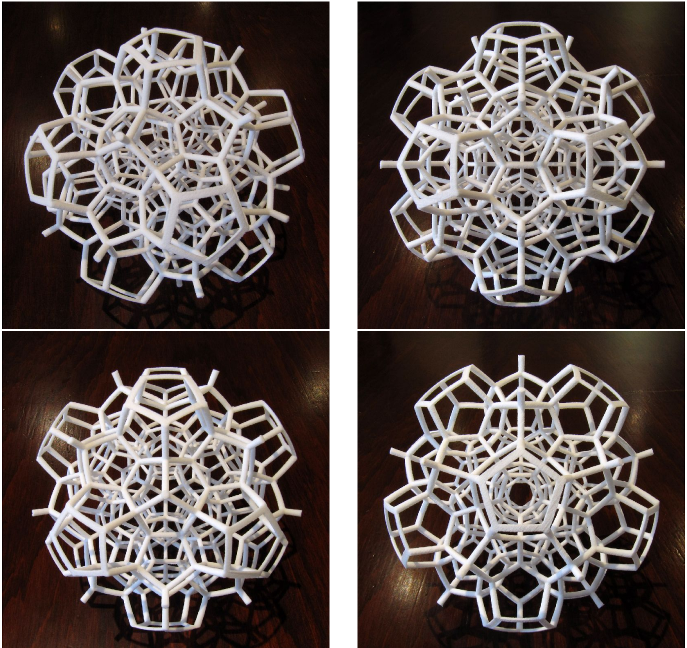
24-Cell



120-Cell?

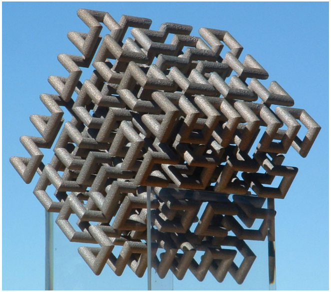


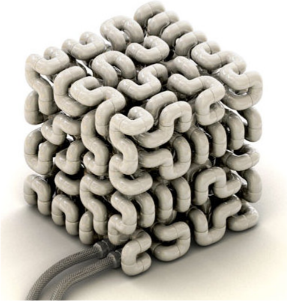
Half 120-Cell

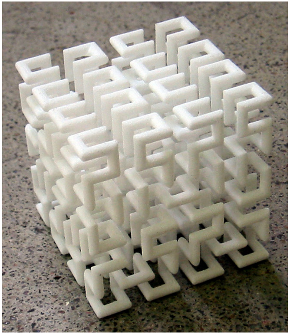


Juggling Club Motion

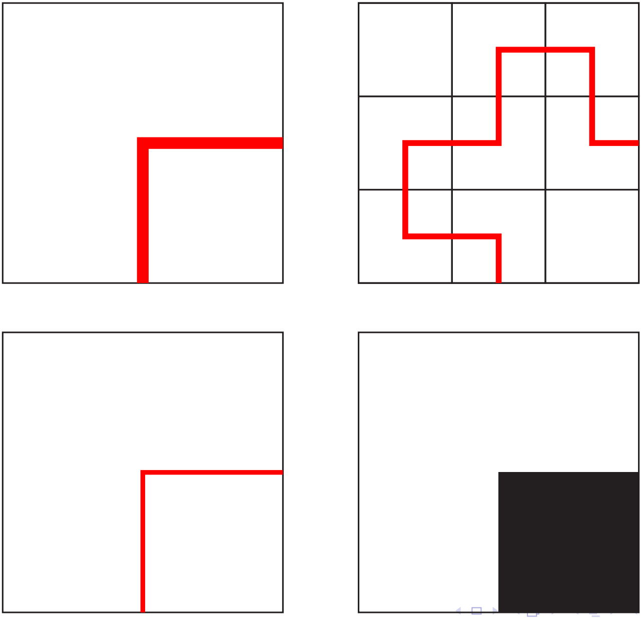
Space filling curves







Fractal graphs by iterated substitution



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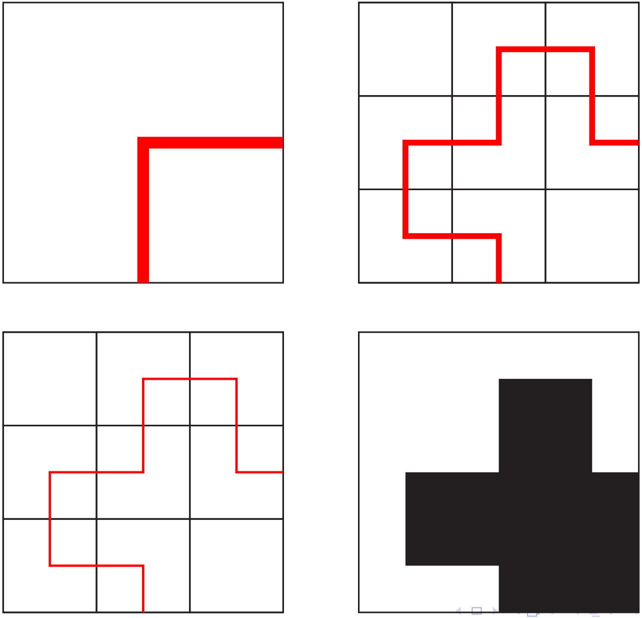

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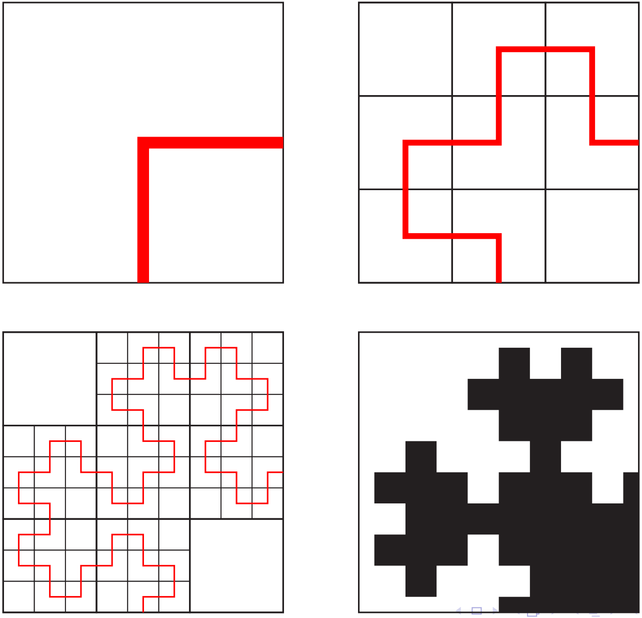

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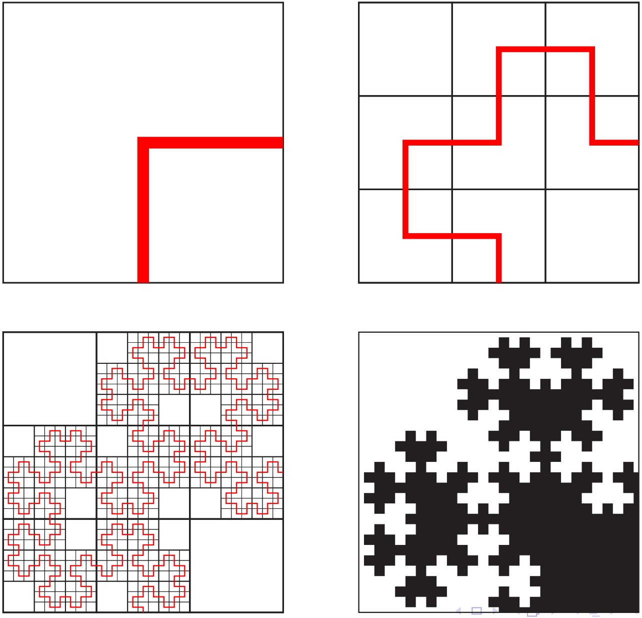

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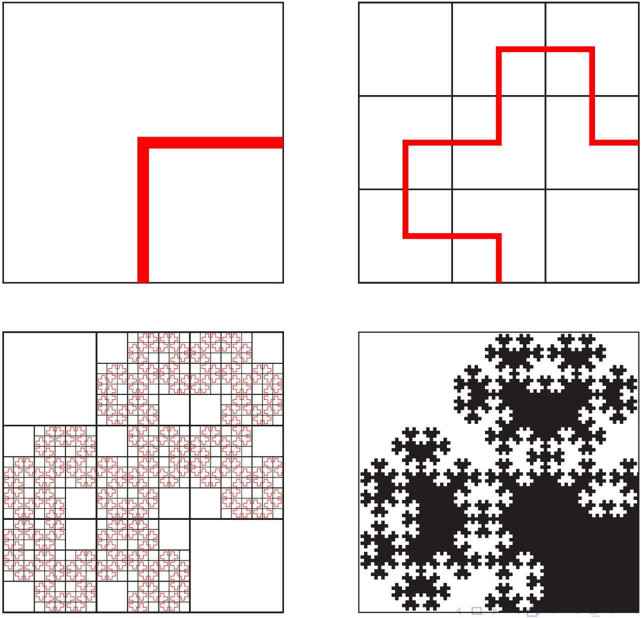

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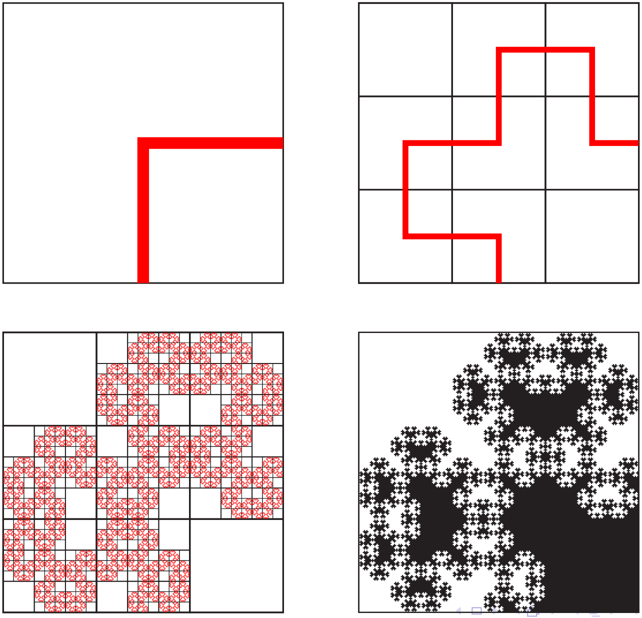
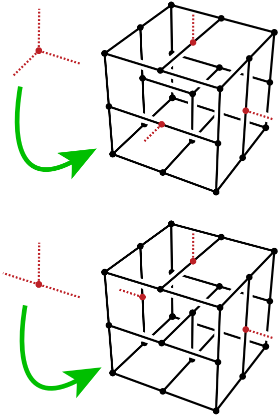
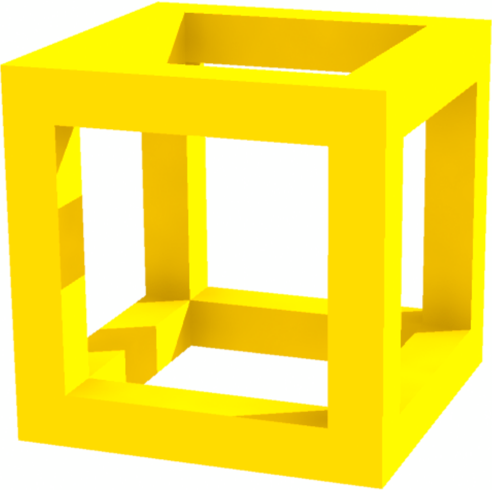


First attempt at a more rigid structure





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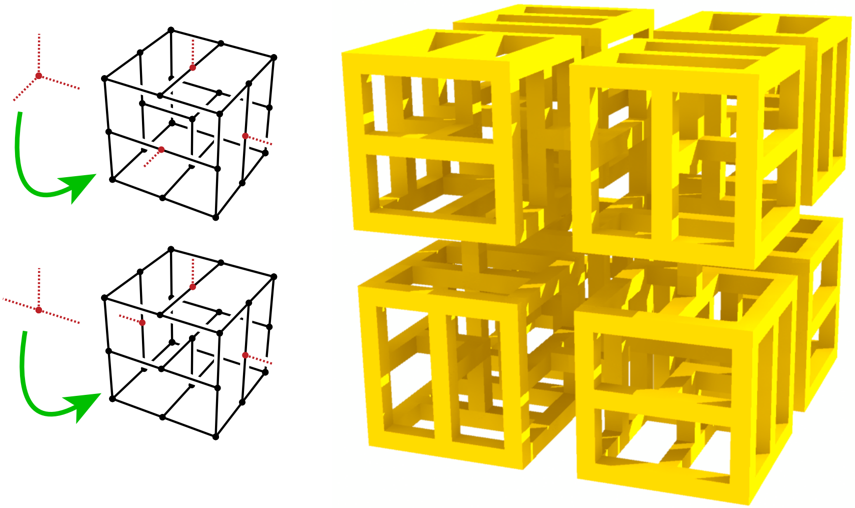

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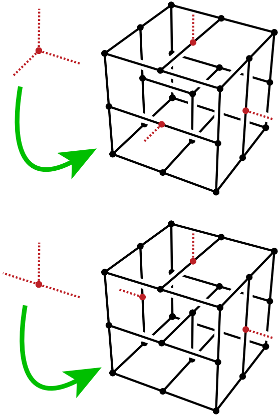

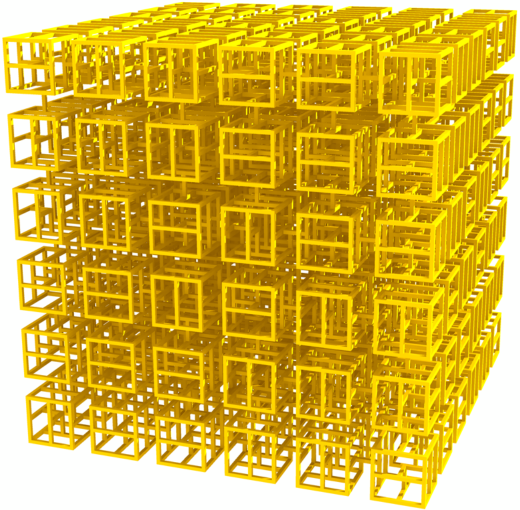

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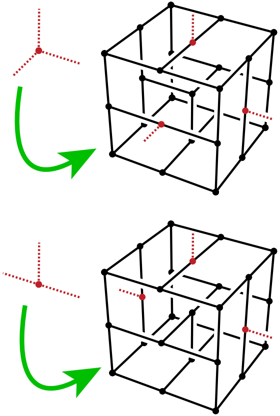
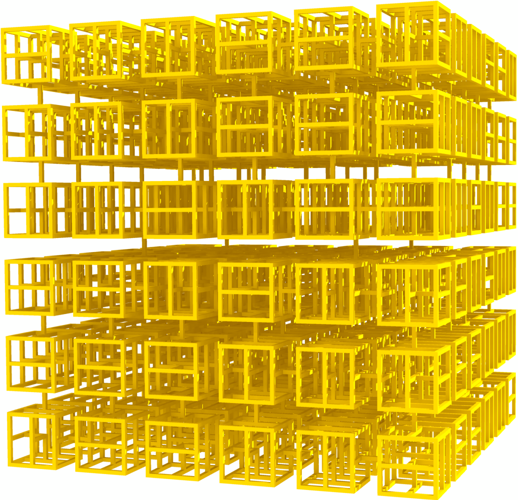
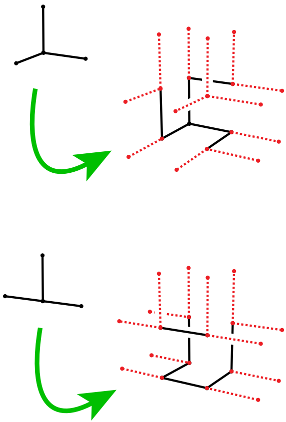
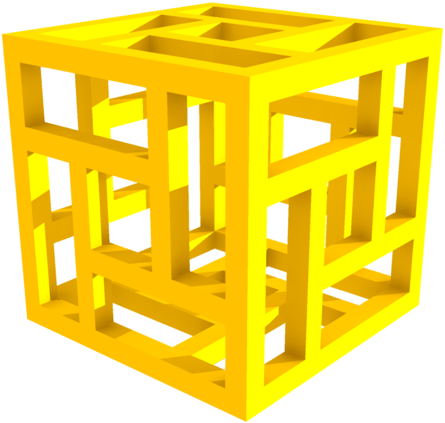




A better scheme





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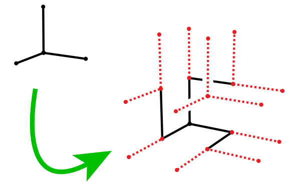

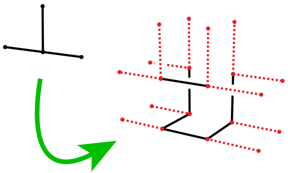

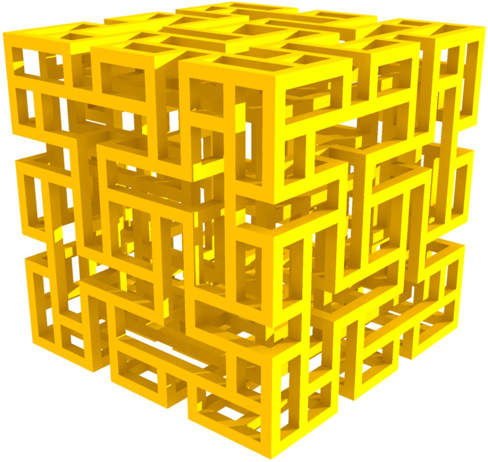

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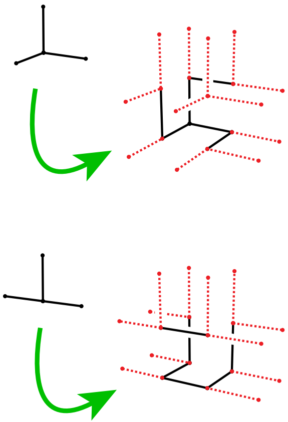

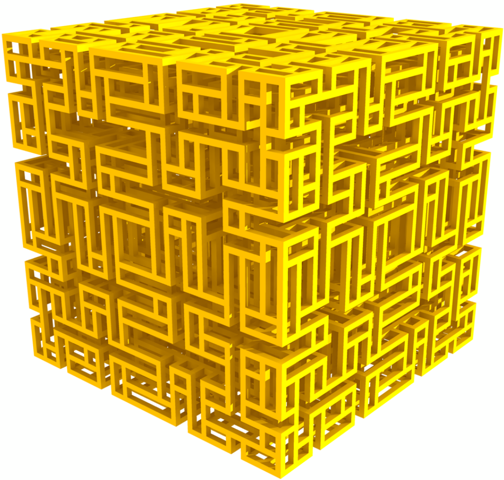

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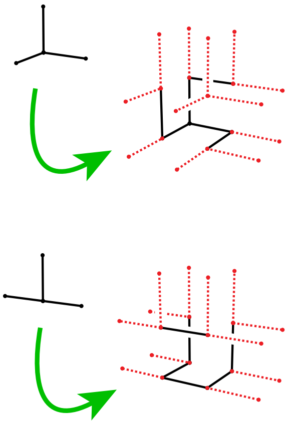
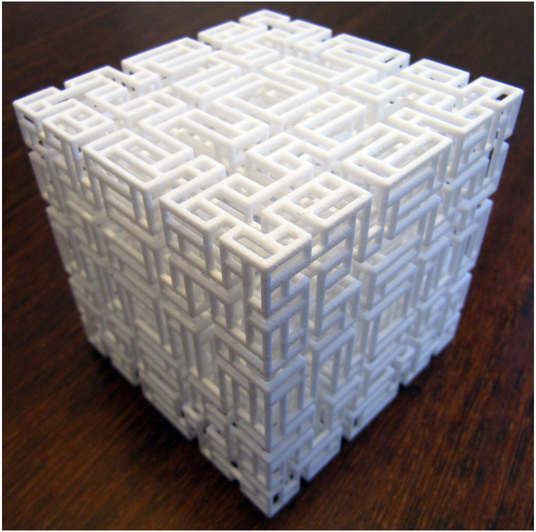
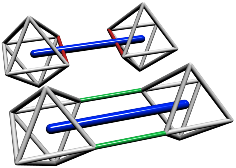
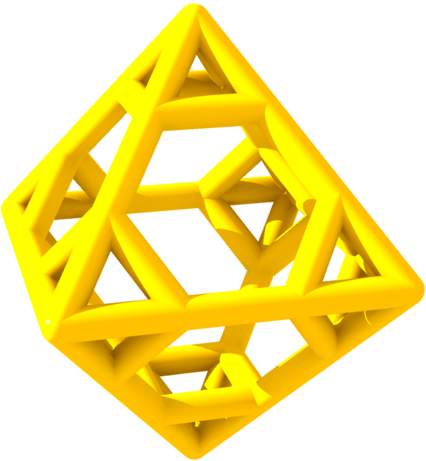




Octahedron Fractal Graph





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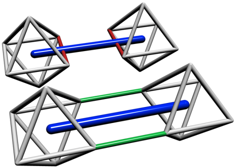

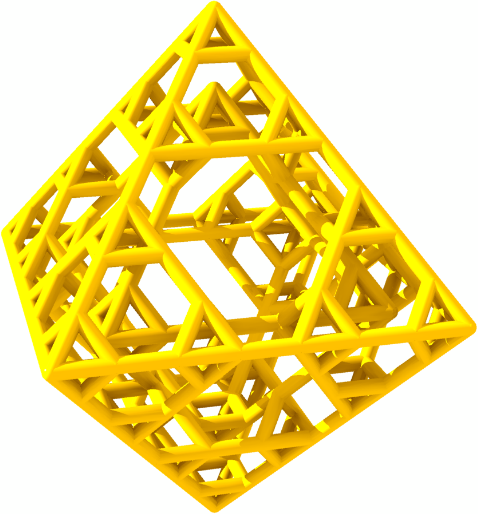

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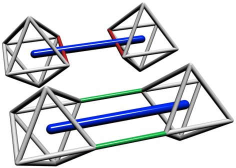

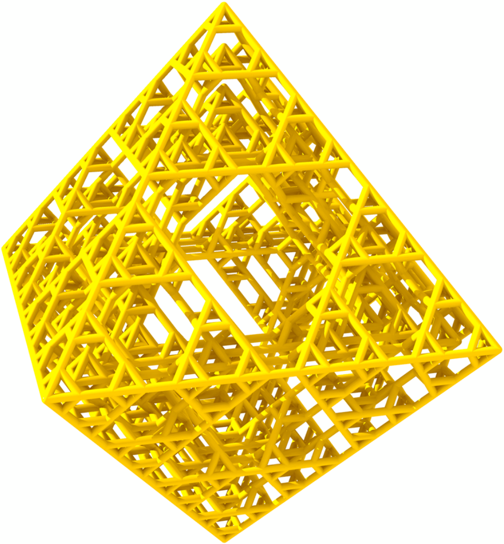

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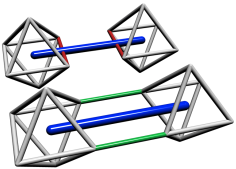

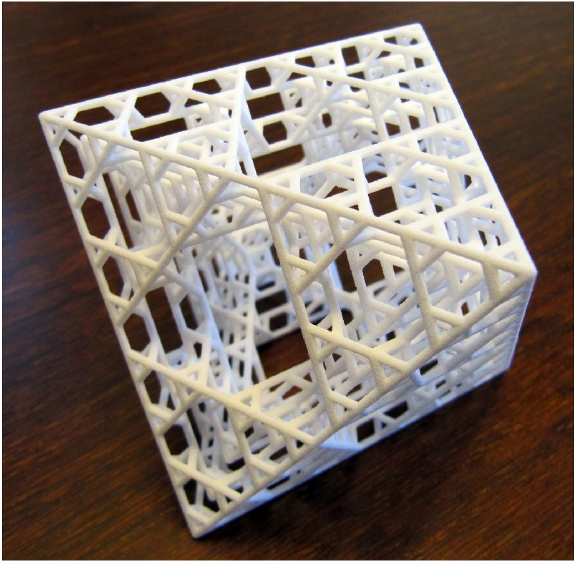

Fractal graph 3