

Visualizing the Fourth Dimension, and the Simplest Thing I Don't Know About It

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Abstract. Much as we can understand 3-dimensional objects by staring at their pictures and x-ray images and slices in 2-dimensions, so can we understand 4-dimensional objects by staring at their pictures and x-ray images and slices in 3-dimensions, capitalizing on the fact that we understand 3-dimensions pretty well. So we will spend some time staring at and understanding various 2-dimensional views of a 3-dimensional elephant, and then even more simply, various 2-dimensional views of some 3-dimensional knots. This achieved, we'll take the leap and visualize some 4-dimensional knots by their various traces in 3-dimensional space, and this achieved, I will tell you about the simplest problem in 4-dimensional knot theory whose solution I don't know.

Visualizing the Fourth Dimension	
The elephant	A 4D knot
<ol style="list-style-type: none">1. project & hide2. project & colour code3. slice & animate.	The 4D crossings
A knot	view as flying rings view as coloured tubes view as cut tubes view as "inflated bands".
The crossings	The inflation procedure

Satoh's conjecture.

Rosoman moves

what's "the same"

Reid. moves & Thm.

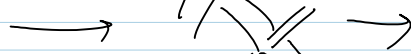
movie moves

w-moves

Satoh's conjecture via double inflation,

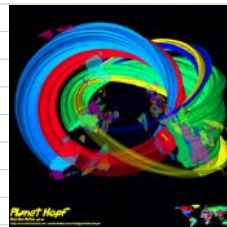


2D



etc.

3D



4D

The w-calculus below is a complete description of ribbon 2-knots in 4D:

$$\begin{array}{c} \diagup \\ \diagdown \end{array} = \begin{array}{c} \diagdown \\ \diagup \end{array} \quad \text{etc.}$$

Then continue as above.