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State Integral Partition function of knots and links

We briefly review $SL(2, \mathbb{C})$ -Chern-Simons partition function $Z[\mathcal{M}]$ on a closed three-manifold \mathcal{M} obtained from Dehn fillings on a link complement $\mathbb{S}^3 \setminus \mathcal{L}$. We focus on links \mathcal{L} which are connected sum of a knot \mathcal{K} with a Hopf link H ($\mathcal{L} = \mathcal{K} \# H$). Motivated by our earlier work on topological entanglement and the reduced density matrix σ expression for such link complements, we wanted to determine a choice of Dehn filling so that $\text{Tr } \sigma = Z[\mathcal{M}]$.

Using `\text{SnapPy}`, we deduce a choice of the Dehn fillings which gives the imaginary part of the leading order term in the perturbative expansion of $Z[\mathcal{M}]$ to be the hyperbolic volume of the knot \mathcal{K} . We have given explicit results for knots $\mathcal{K} = 4_1, 5_2, 6_1, 6_2$ and 6_3 .

Field of contribution

Theory

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