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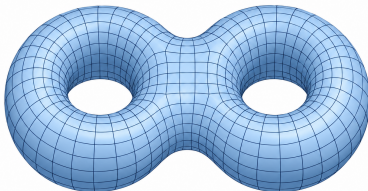
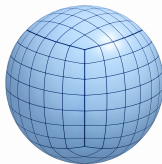
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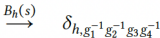
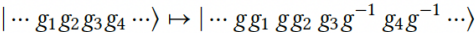
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like designing a topological quantum computer without relying on the fractional quantum Hall effect?

Particle with basis of states labelled by $|g\rangle$, $g \in G$, for a finite group G .

Place one particle on every (oriented) edge of a square-tiled surface:





On a surface Σ , the dimension of the space of ground states equals the number of group homomorphisms

$$\pi_1(\Sigma) \rightarrow G,$$

up to conjugation by G . (topological protection)

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MATH5340: Algebraic Topology

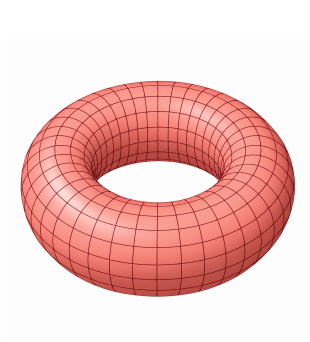
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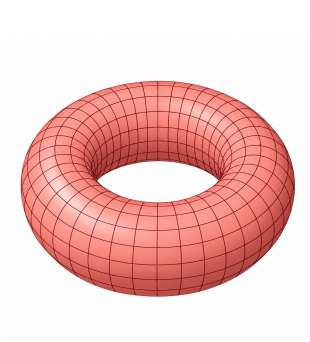
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MATH5340: Algebraic Topology

For Σ the torus $\pi_1(\Sigma) = \mathbb{Z} \times \mathbb{Z}$.



A basis of ground states is then naturally labelled by the simple representations of $\mathbb{C}G \ltimes \mathbb{C}[G]$.



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MATH4314: Representation Theory

Local analysis in a very large network requires (thermodynamic) limit to infinite dimensional Hilbert spaces.

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MATH4312: Commutative Algebra