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Surgery in colored tensor models

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Abstract

Rooted in group field theory and matrix models, random tensor models are a recent background-invariant approach to quantum gravity in arbitrary dimensions. Colored tensor models (CTM) generate random triangulated orientable (pseudo)-manifolds. We analyze, in low dimensions, which known spaces are triangulated by specific CTM interactions. As a tool, we develop the graph-encoded surgery that is compatible with the quantum-field-theory-structure and use it to prove that a single model, the complex φ^4-interaction in rank-2, generates all orientable 2-bordisms, thus, in particular, also all orientable, closed surfaces. We show that certain quartic rank-3 CTM, the φ^4_3-theory, has as boundary sector all closed, possibly disconnected, orientable surfaces. Hence all closed orientable surfaces are cobordant via manifolds generated by the φ^4_3-theory.

Keywords: Quantum gravity; random tensor models; Feynman diagrams; matrix models.
Journal of Geometry and Physics subject classifications: Quantum gravity, quantum field theory, discrete geometry
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Contents

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