

Chern-Simons invariants and conformal embedding of 3-manifold

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This talk studies the Chern-Simons invariant of a closed oriented Riemannian 3-manifold M . The first achievement is to establish the formula $CS(e) - CS(e') = deg(A)$, where e and e' are two frames of M , and A is a map from M to $SO(3)$. An interesting phenomenon is that the "jump" of the Chern-Simons integrals for various frames of many 3-manifolds are at least two, instead of one.

The second purpose is to give an explicit representation of $CS(e_+)$ and $CS(e_-)$ for the left and right quaternionic frames on M induced from an immersion in the Euclidean space E^4 , respectively. Consequently we find many metrics on the 3-sphere (Berger sphere) so that they can not be conformally embedded in E^4 .

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