Oberseminar Geometrie und Topologie

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Cauchy spinors on 3-manifolds

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Abstract: The so-called Cauchy spinors arise naturally when one considers the restriction of a parallel spinor on a spin-manifold Z to an oriented hypersurface M of Z. The covariant derivative of such a restriction in the direction of $X \in TM$ is given by the Clifford multiplication by $-A(X)/2$, where A is the second fundamental form of the hypersurface. Then, we can consider more generally the spinors satisfying this last condition on a manifold M, with A being an arbitrary symmetric endomorphism field, and this is what we call Cauchy spinors.

In dimension three, the study of Cauchy spinors on simply connected manifolds is equivalent to the flatness of a connection, which is equivalent to an equation on the endomorphism field A. Since this is a non-linear differential equation, it is still hard to fully understand the structure of this spinor space, even in the simple case of the round sphere S^3. However, we can give some classification results on manifolds with positive curvature. Moreover, we can use the Lie group structure of S^3 in order to make explicit computations.

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