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Title: An Approach to the Dodecahedral Conjecture Based on Bounds for Spherical Codes

Abstract:

The dodecahedral conjecture states that in a packing of unit spheres in \mathbb{R}^3 , the Voronoi cell of minimum possible volume is a regular dodecahedron with inradius one. The conjecture was made by Fejes Toth in 1943, and proved by Hales and McLaughlin in 1998 using techniques developed by Hales for his proof of the Kepler conjecture. The proof of Hales and McLaughlin, while apparently correct, is difficult to verify due to the many cases and extensive computations required. In 1964, Fejes Toth suggested a proof scheme for the dodecahedral conjecture but was unable to verify a key inequality. The same inequality arises in a new proof of the Kepler conjecture recently announced by Hales. We describe an approach to proving Fejes Toth's key inequality that uses strengthened SDP bounds for spherical codes.