Symmetries, Isometries and Length Spectra of Closed Hyperbolic Three-Manifolds

Craig D. Hodgson
Jeffrey R. Weeks

Abstract

Previously known algorithms to compute the symmetry group of a cusped hyperbolic three-manifold and to test whether two cusped hyperbolic three-manifolds are isometric do not apply directly to closed manifolds. But by drilling out geodesics from closed manifolds one may compute their symmetry groups and test for isometries using the cusped manifold techniques. To do so, one must know precisely how many geodesics of a given length the closed manifold has. Here we prove the propositions needed to rigorously compute a length spectrum, with multiplicities. We also tabulate the symmetry groups of the smallest known closed hyperbolic three-manifolds.