ISOSPECTRAL SURFACES WITH DISTINCT COVERING SPECTRA

The covering spectrum of a manifold measures size of one-dimensional holes in a Riemannian manifold. More precisely, if we are given a manifold M, we look at a certain family of covering spaces $\{\tilde{M}^\delta\}$ indexed by positive real number such that $\tilde{M}^\delta$ covers $\tilde{M}^{\delta'}$ whenever $\delta < \delta'$. Then, the covering spectrum consists of the values of δ where we see a "jump" in the isomorphism type of the covering spaces $\tilde{M}^\delta$. It is an interesting fact that these jumps are half the length of the shortest closed geodesic in certain free homotopy classes. Consequently, it is natural to ask whether the covering spectrum is a spectral invariant.

Using a variant of Sunada's method, De Smit, Gornet, and Sutton showed that for compact manifolds of dimensions three or greater, the covering spectrum is not a spectral invariant. In a later article, they show that the covering spectrum is not a spectral invariant of surfaces by using a graph theoretic method. In this talk I will prove that the covering spectrum is not a spectral invariant of surfaces by using this graph theoretic method with new examples that are easier to understand than those used by De Smit, et al.