A local test for global extrema in the dispersion relation for periodic graphs

Jeremy Marzuola

University of North Carolina at Chapel Hill, USA

September 28, 2020

With Greg Berkolaiko, Yaiza Canzani and Graham Cox, we consider a family of periodic tight-binding models (which are combinatorial graphs with Laplacian operators that have edge weights parametrized over tori). It will be important that our graphs have the minimal number of links between copies of the fundamental domain. For this family of graphs, we establish a local condition of second derivative type under which the critical points of the dispersion relation can be recognized as global maxima or minima. We will try to give an introduction to periodic graphs, as well as their applications. In addition, we will demonstrate our results with a number of example graphs.