Asymptotic behaviour of eigenvalues in glueing constructions and new minimal surfaces via shape optimization

Henrik Matthiesen
University of Chicago

May 11, 2020

Since maximizing metrics for the Laplace eigenvalues, normalized by the area, and the Steklov eigenvalues, normalized by the length of the boundary, arise as induced metrics from minimal surfaces, we can try to solve these optimization problems to find minimal surface. In the case of the Laplace operator on closed surfaces these are minimal surfaces in round spheres. For Steklov eigenvalues on surfaces with boundary these are free boundary minimal surfaces in Euclidean balls. Very recently, these maximization problems have been fully settled in both cases for the first eigenvalue. In particular, this gives rise to new examples of minimal surfaces of the aforementioned types. I will first give a very brief sketch of the program to obtain these maximizing metrics. Then, I will try to give some idea of our glueing constructions completing this program for the first eigenvalue. This is based on joint work with Anna Siffert and joint work with Romain Petrides.