1057-49-361 **Chiu-Yen Kao*** (kao@math.ohio-state.edu), 410 Math Tower, 231 West 18th Ave., Columbus, OH 43202. *An Efficient Rearrangement Algorithm for Shape Optimization on Elliptic Eigenvalue Problems.*

In this talk, we will discuss an efficient rearrangement algorithm to find the optimal shape and topology for elliptic eigenvalue problems in an inhomogeneous media. The method is based on Rayleigh quotient formulation of eigenvalue and a monotone iteration process to achieve the optimality. The common numerical approach for these problems is to start with an initial guess for the shape and then gradually evolve it, until it morphs into the optimal shape. One of the difficulties is that the topology of the optimal shape is unknown. Developing numerical techniques which can automatically handle topology changes becomes essential for shape and topology optimization problems. The level set approach based on both shape derivatives and topological derivatives has been well known for its ability to handle topology changes. However, CFL constrain significantly slows down the algorithm when the mesh is further refined. Due to the efficient binary update and optimal rearrangement, our method not only has the ability of topological changes but also is exempt from CFL condition. We provide numerous numerical examples to demonstrate the robustness and efficiency of our approach. (Received January 26, 2010)