1116-49-1560 **Dominique Zosso*** (zosso@math.ucla.edu), **Braxton Osting** and **Stanley J. Osher**. *A Dirichlet energy criterion for graph partitioning and image segmentation.*

We consider the graph partitioning problem using a criterion based on the sum of the minimal Dirichlet energies of partition components. This is a bi-level optimization problem; we propose an efficient primal-dual method for computing the Dirichlet energy ground state of partition components (inner problem), and a rearrangement algorithm is used to improve graph partitions (outer problem).

We demonstrate the graph partitioning method on the five-moons toy problem, the MNIST data set, as well as 2D and 3D domain partitioning. We also extend it to a graph-based approach for image segmentation. To this end, we introduce several novel graph construction models which are based on graph-based segmentation criteria extending beyond—and bridging the gap between—segmentation approaches based on edges and homogeneous regions alone.

The method is applied to a number of example segmentation problem. We illustrate the various image-based graph constructions, before successfully running a variety of region-, edge-, hybrid, and texture-based image segmentation experiments. Our method seamlessly generalizes region- and edge-based image segmentation to the multi-phase case and can intrinsically deal with image bias as well as more interesting image features such as texture descriptors. (Received September 20, 2015)