ShapeFit: Exact location recovery from corrupted pairwise directions

Paul Hand[1,⋆], **Choongbum Lee**[2], **Vladislav Voroninski**[2]

1. Rice University, Department of Computational and Applied Mathematics
2. Massachusetts Institute of Technology, Department of Mathematics
⋆Contact author: hand@rice.edu

Keywords: Camera location estimation, convex programming

We consider the problem of recovering a set of locations given a subset of corrupted pairwise direction observations. The three-dimensional case of this problem is a subtask in the Structure from Motion pipeline for 3d structure recovery based on a collection of images from different vantage points. We introduce a novel convex program for the location recovery problem. We prove that this program recovers a set of Gaussian locations exactly and with high probability if the observations are given by an Erdös-Rényi graph, and provided that at most a constant fraction of observations involving any particular location are adversarially corrupted. We also demonstrate that the convex program is stable to the additional presence of noise.