

APPLIED MATHEMATICS COLLOQUIUM

ShapeFit: Exact Location Recovery from Corrupted Pair-Wise Directions

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Abstract: Recovering a set of locations from corrupted observations of pair-wise directions between them is a fundamental task in computer vision, arising from the problem of recovering the 3D structure of a scene from a collection of images about that scene taken from unknown vantage points. We propose a simple convex program in minimally many variables and establish that a set of deterministic conditions on the locations and observations is sufficient for exact location recovery via this program. Using these deterministic conditions, we show that recovery is exact with high probability when the locations are iid gaussian, the pair-wise direction observations adhere to an Erdős–Rényi graph, and the corruptions follow a degree bound at each location, otherwise being adversarial. These are the first theoretical results for exact recovery in this challenging setting for any location recovery algorithm. We complement these results with a numerical study which empirically confirms the effectiveness of our approach for exact and stable location recovery from corrupted observations.

This is joint work with Paul Hand and Choongbum Lee.

**Monday October 5, 2015
4:30 PM
Room E17-122**

Applied Math Colloquium: <http://www-math.mit.edu/amc/fall15/>
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