Recovering Correct Reconstructions from Indistinguishable Geometry
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Motivation

- Method is a post-process step to existing structure-from-motion (SfM) pipelines
- Efficiently split reconstruction into consistent sub-models
- Recover correct reconstruction by merging sub-models

Contributions

Input

- Dataset Name | # Cameras | # Points | Time | Time [s]
- San Marco (using icons) | 3372 | 410592 | 3.0 m | 5.6 m
- Brandenburg Gate | 50 | 8046 | 18 s | 12 s
- Arc de Triomphe | 192 | 32708 | 1.7 m | 2.7 m
- Giotto’s Campanile | 211 | 52620 | 4.4 m | 22.5 m

Local Clustering Coefficient

\[ lcc = \frac{2 \times \text{(# of edges between neighbors)}}{\text{(# of neighbors)} \times \text{(# of neighbors)} - 1} \]

Model Splitting

- Iteratively remove points with lowest lcc from co-occurrence graph, and discard an edge from the camera graph when all of its points have been removed
- Stop removing points when the camera graph no longer forms a single connected component
- Analyze correctness of split in the camera graph using overlapping correspondences

- If non-negligible overlap, identify indistinguishable points
- Expand indistinguishable point set to inliers and nearby 2D image points
- Re-split reconstruction using updated indistinguishable point set

Model Merging

- Find camera pairs from match graph that were not used in final 3D model
- Propose similarity transform to align sub-models by sampling unused camera pairs

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