

The Title Should Be Large and Easy to Read

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SIGGRAPH 2016
Render the Possibilities

Problem

In this work, we estimate the camera pose using an overhead image captured by a low-altitude aerial device as query and a corresponding building point cloud as 3D model.

Related Work

- Image database
 - Multiple nearest neighbor feature matching [Zamir and Shah, 2014]
- Image captured on the ground
 - 2.5D map [Arth et al. 2015]
- Image captured in high altitude
 - Extended Chamfer matching [Zhang et al. 2014]

Challenges

- Low-altitude aerial image is not able to take advantages of vanishing points.
- Low-altitude aerial image suffers from more critical perspective effect.

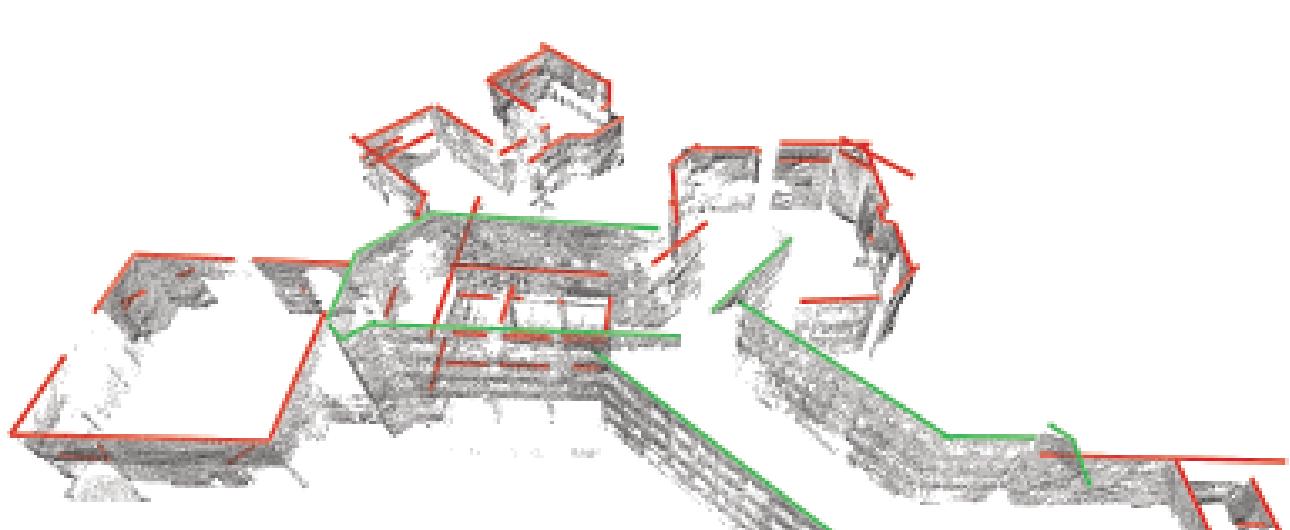
Our Approach

- Observations: vertical facades of a point cloud correspond to edges of building roofs in the overhead image.
- We propose a geo-localization algorithm based on multi-altitude shape matching and iterative optimization.

Input



An overhead image captured by an aerial device in low altitude.



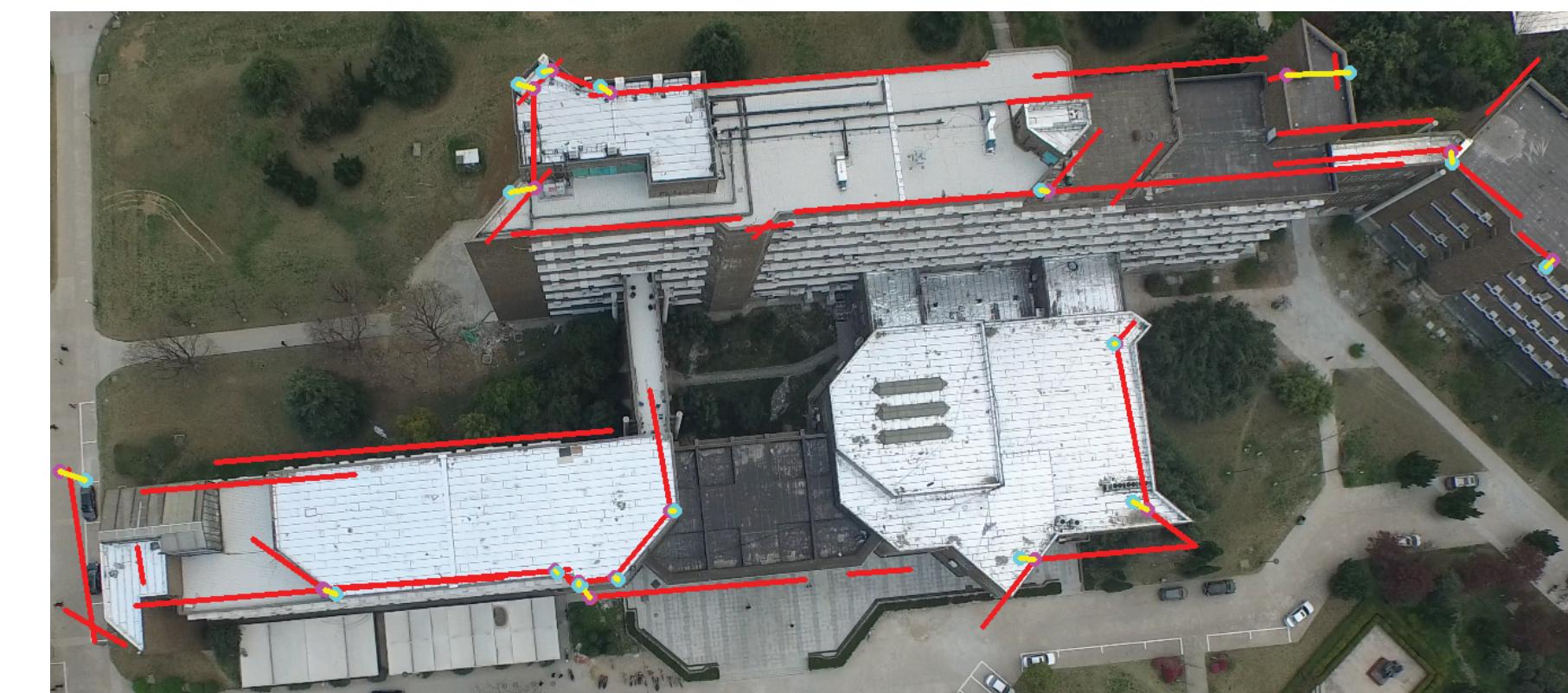
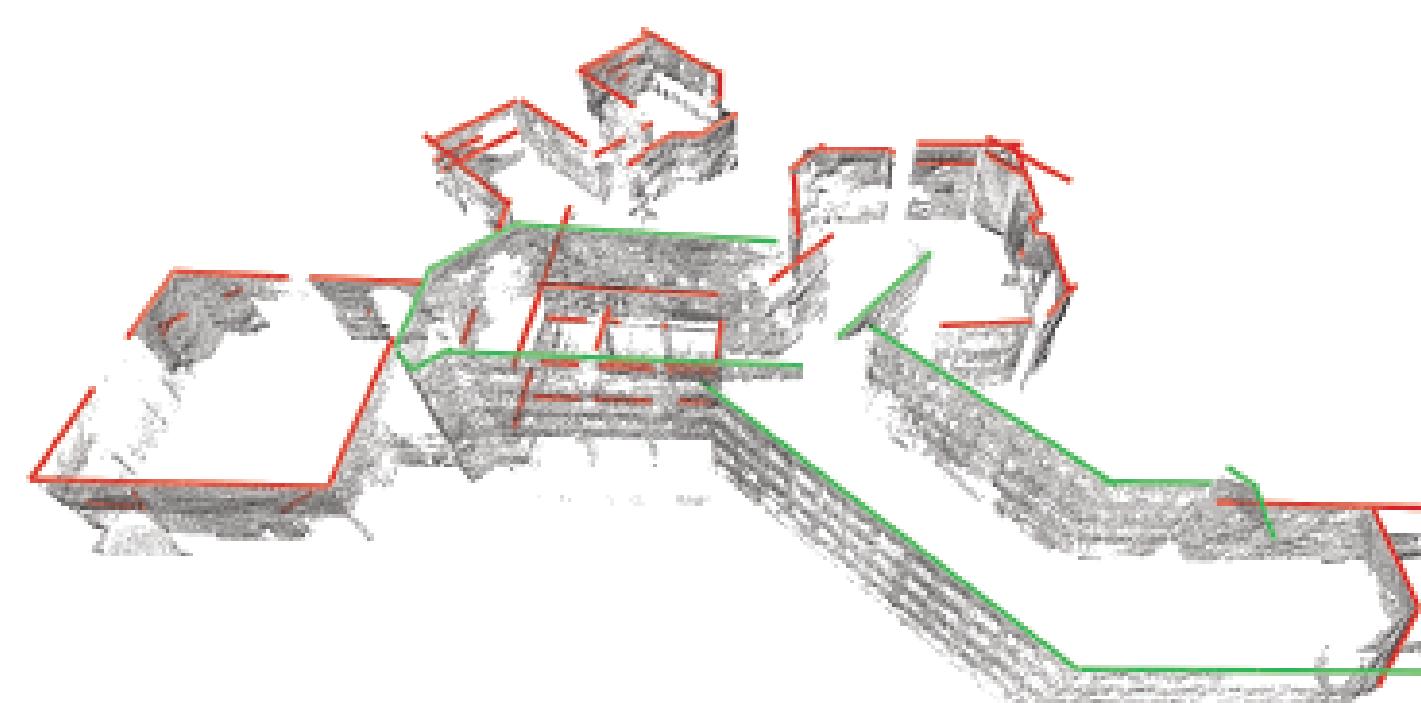
A point cloud captured by a laser device on the ground.
<to be modified>

Paired feature points

- For a 3D feature point, we project it on the overhead image (magenta points) using current project matrix and search in its neighborhood for a corner (cyan points). These 3D feature points and corresponding corners will form pairs of feature points for next iteration of calculating global matrix.

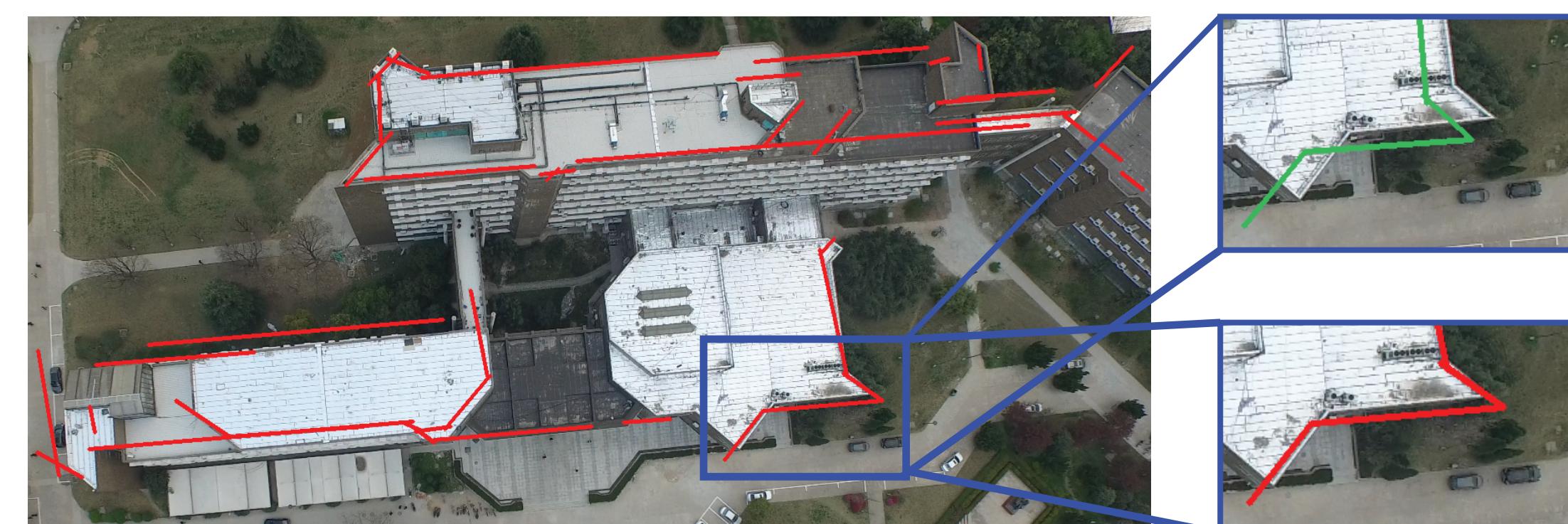


Method



- Step 1: Fit sets of lines in different altitudes as contours of building roofs and extract corners of these contours as 3D feature points.
- Step 2: Match contours with the overhead image respectively and achieve one local project matrix for each contour.
- Step 3: Achieve a global project matrix by iteratively minimizing the average distance between projected contours and the edges of the overhead image.

Results



Before global optimization

After global optimization

References<to be modified>

Clemens Arth, Christian Pirchheim, Jonathan Ventura, Dieter Schmalstieg, and Vincent Lepetit. 2015. Instant Outdoor Localization and SLAM Initialization from 2.5D Maps. *IEEE Transactions on Visualization and Computer Graphics* 21, 11 (2015),