Registering Point Clouds to OSM Building Outlines

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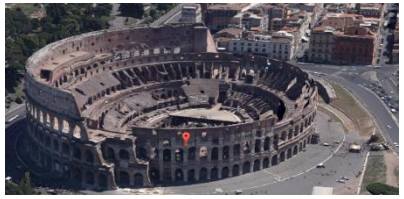
Introduction

- Goal: Implement a method to reliably fit a SfM point cloud to 2D building shapes
  - Shapes are provided by OSM (manually generated by users)
  - Point cloud data acquired by SfM (from photographs)
- Will help generate informative 3D landscapes of cities
- Needs fewer resources and relies on user generated accurate OSM maps and any collection of images like Flickr.

Motivation

- Bridge the gap between different representations of the same entity

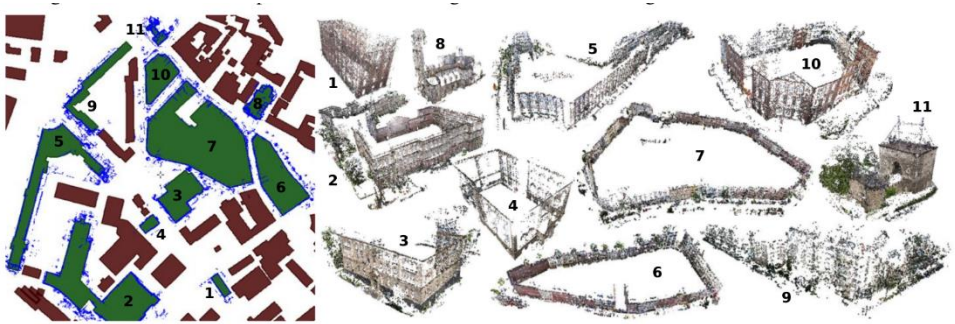


- **Accurate**
- **Extensive**
- **User generated**
- **…**

- **Easy to generate**
- **Online photo collection**
- **Quick and less demanding**
- **…**

- Build large-scale informative cityscapes

WP1: Segmenting the point cloud



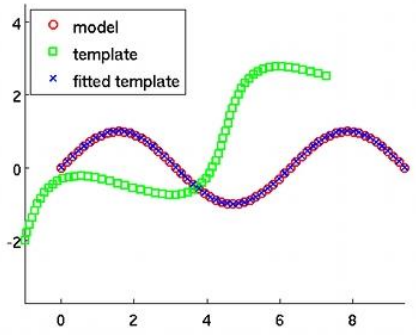
SfM point clouds of buildings and their registration onto building outlines [1]

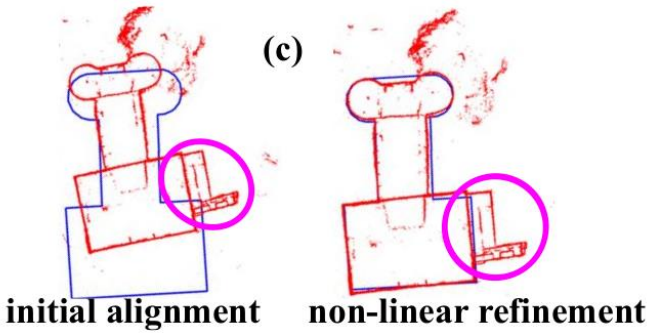
- 2D “footprint” of the point clouds to enable registration onto OSM building outlines
- Estimation of up-vector for detecting the ground plane
- Segmenting the part of point cloud that forms the building's facades using point normals
- Extracting building footprints by projecting the points onto ground plane

- [1] O. Untzelmann, T. Sattler, S. Middelberg, and L. Kobbelt. A scalable collaborative online system for city reconstruction. In Computer Vision Workshops (ICCVW), 2013 IEEE International Conference on, pages 644–651, Dec 2013.

WP2: Aligning Point Cloud footprint with OSM data

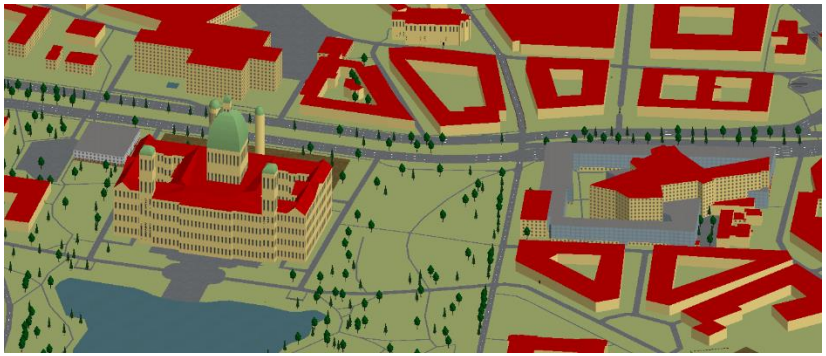
- Using “Iterative Closest Point” (ICP) algorithm for fitting building shapes
- project building facades into ground plane (2D)
- If GPS available, use for initial guess
- Evaluate removing undetectable things from OSM (holes, inside walls)





Further: Building Height + Roof Shape Estimation

- Building height estimation from lowest and highest plane along upvector (can be contributed back to OSM)
- Absolute value known because of merging with OSM data
- Roof Shape estimation: Harder problem (point cloud on top sparse, because images taken from groundlevel)
  - Take images from above, or use symmetry, and maybe human input to estimate roof shapes



Timeline

- **End of March:** First prototype ready: Evaluated and Tested.
  - W P 1 : Bundler File parser and interfacing with PCL library.
  - W P 2 : ICP with “handmade” OSM data.
- **Mid April:** Most of the work involved in individual work packages implemented.
  - W P 1 : Normal & up-vector estimator done.
  - W P 2 : Functioning outline matching ready. Tested on Point Cloud and OSM data.
- **Mid of May:** Tight integration of both work packages, work on height (and maybe roof shape) guesser.

Thank You!!

Questions?
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