Depth Map based Facade Abstraction from Noisy Multi-View Stereo Point Clouds Supplementary Material

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Abstract. Multi-View Stereo offers an affordable and flexible method for the acquisition of 3D point clouds. However, these point clouds are prone to errors and missing regions. In addition, an abstraction in the form of a simple mesh capturing the essence of the surface is usually preferred over the raw point cloud measurement. We present a fully automatic pipeline that computes such a mesh from the noisy point cloud of a building facade. We leverage prior work on casting the computation of a 2.5D depth map as a labeling problem and show that this formulation has great potential as an intermediate representation in the context of building facade reconstruction.





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1 Good Input, Good Output

1.1



- Not a building facade but a fountain
- Structure similar to facades
- Very strong texture
- Ideal point cloud quality

Good

- Captures the main structures quite well, even thin ones
- For the most part, nice flat abstractions of the bumpy surfaces

- Slight curvature in the point cloud leads to breaks in the primary plane
- Left and right part not as clean as the center region
- Few additional depth layers due to the bumpy surface



- For the most part acceptable input quality
- Shadows, occlusions, and a tree result in some holes

Good

- Nice delineation of windows, balconies, and the oriel
- Handles missing regions reasonably

- Windows not very rectangular
- Reconstruction of the curtains behind the window planes not desired



- Very similar to the previous dataset

Good

- Nice delineation of windows and balconies
- Handles missing regions reasonably
- Correct reconstruction of the door's angled corners

- Some windows not very rectangular
- Thin windows missing
- Windows/Doors towards the balconies are only reconstructed up to the occlusion boundary (no use of semantic knowledge)

 $\mathbf{1.4}$



- Insufficient texture
- Some clutter (bicycles directly in front of the facade)

Good

- Nice reconstruction of windows and arches, given the quality of the input data
- Handles missing regions reasonably
- Good suppression of noise

- Main facade plane fractured into two pieces
- Bicycles affect geometry



- Insufficient texture in the bottom half
- Angled surfaces below the oriels

Good

- The oriels and most windows are captured
- Arguably an improvement over the poisson mesh

- Some clutter remains
- Some of the arched windows are not well preserved
- Angled surfaces can not be expressed



- Insufficient texture in the shadowed regions
- Some clutter

Good

- Reasonable reconstruction of the oriel and windows
- Good handling of missing regions
- Implicit modeling of (weakly supported) surfaces through depth jumps performs quite well

- Some clutter remains
- Windows/Doors towards the balconies are only reconstructed up to the occlusion boundary (no use of semantic knowledge)



- Strong brick texture
 Repetitive texture of the shutters leads to noise in the point cloud

Good

- Good reconstruction of the walls and most of the windows
- Suppression of noise on the shut- ters

Bad

– Some window and shutter planes are fractured

2 Bad Input, Bad Output



- More missing regions due to shadows, occlusions, and a tree

Good

- Nice reconstruction of the oriel and windows
- Rounded balconies handled reasonably

- Right side mostly flat
- Oriel planes fractured
- Symmetry, if detected automatically, could improve the reconstruction significantly

 $\mathbf{2.1}$



- Very bad input quality
- Noisy point cloud
- Large region missing due to a tree

Good

- Reasonable main facade planeMost windows ok

Bad

- Lots of clutter

3 Good Input, Bad Output

3.1



- Good input quality
- Angled facade planes

Good

- Actually quite good reconstruction of windows
- Staircase effect partially hidden by the texture
 - Still, angled surfaces present an important point of future work

Bad

 Incorrect handling of angled surfaces 12 Andreas Ley and Olaf Hellwich

 $\mathbf{3.2}$



- Angled oriel

Good

- Good reconstruction of windows and even some shutters
- Correct reconstruction of the slightly deeper facade planes between the two window pairs on the right

- Staircase reconstruction of the angled surface very noticable
- Incorrect depth jump of the facade plane at the upper shadow line
- Upper windows not reconstructed



- Oriel with side facing windows
- Barely enough texture
- Slightly *curved* facade plane
 - We are not sure if the curvature really exists, or if it is the result of slightly wrong camera parameters

Good

- Nice reconstruction of the oriel and arches
- Good handling of incomplete regions

- Window delineation slightly off (Not apparent in the images)
- Facade plane fractured into many pieces due to the curvature
- Side facing windows can not be modeled due to the restrictions of the depth map
- Unobserved surfaces in dire need of proper texture synthesis