3D WATERTIGHT MESH GENERATION WITH UNCERTAINTIES

Laurent Caraffa
IGN, France
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3D watertight mesh generation with uncertainties

IQmulus workshop

Laurent Caraffa, Murat Yirci, Mathieu Brédif, Bruno Vallet

21 Sept 2016
Watertight mesh reconstruction

- **Input**
  - Aerial Lidar (SAA - IGN).
  - Terrestrial Lidar (MATIS - IGN).
  - Photogrammetry (TS - IGN).

- Watertight surface
Watertight mesh reconstruction

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⇒ How to merge?
⇒ How to scale?
Approach

3D segmentation

- Binary segmentation (Inside / Outside) of the 3D space.

⇒ The surface is the interface between inside and outside area.

- Local descriptor computation.
- Space discretization.
  - Delaunay triangulation.
- Score computation.
- Optimization.
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Results

Mesh confidence

![Mesh confidence diagram](image)
Results

Mesh confidence

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3D watertight mesh generation with uncertainties

Watertight surface reconstruction

Accepted in ACCV16: 3D watertight mesh generation with uncertainties from ubiquitous data.
Results

Mesh confidence

![Image of mesh confidence and additional results](image-url)
3D watertight mesh generation with uncertainties

Watertight surface reconstruction

Results

Mesh confidence

![Mesh confidence](image)

![Mean error](image)
Results

Mesh confidence

![Image of mesh confidence with weak to strong range]

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3D watertight mesh generation with uncertainties
Watertight surface reconstruction

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Results

Mesh confidence: weak | strong

![Images of mesh confidence and error graph]

Mean error vs. Nb merges graph:

- Mean error decreases as Nb merges increase.
Results

Mesh confidence

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Mesh confidence

![Mesh confidence images](image_url)
Results

Mesh confidence

![Image of mesh confidence]

![Image of mean error vs. number of merges]

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Mesh confidence: weak to strong
3D watertight mesh generation with uncertainties

Results

Mesh confidence

![Mesh confidence image]

![Graph showing mean error over number of merges]

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Results

Mesh confidence  weak  strong

3D watertight mesh generation with uncertainties

Watertight surface reconstruction
3D watertight mesh generation with uncertainties

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Mesh confidence

![Image of mesh confidence with weak to strong scale]

![Image of 3D model with mesh confidence map]

![Graph showing mean error vs. number of merges]

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![Image of mesh confidence with weak to strong scale]

![Image of 3D models with error graph]

Mean error vs. Nb merges

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Mesh confidence

![Mesh confidence diagram](image)

![Graph showing mean error vs. number of merges](image)
Results

Mesh confidence

![Mesh confidence with examples]

![Graph showing mean error vs number of merges]

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### Out-of-core approach

<table>
<thead>
<tr>
<th>Description</th>
<th>Tiling</th>
<th>Simplification</th>
<th>Triangulation</th>
<th>Score Computation</th>
<th>Segmentation</th>
<th>Surface Extraction</th>
</tr>
</thead>
</table>
Out-of-core approach
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Tiling

Descriptor

Sco

Score computation

Segmentation

Surface extraction

Tiling

Descriptor

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Out-of-core approach

Descriptor

Tiling

Simplification

3D watertight mesh generation with uncertainties

Out-of-core approach
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3D watertight mesh generation with uncertainties

Results
Results
Results
Thank you.

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