

# FACADE EXTRACTION FROM OBLIQUE AIRBORNE IMAGES

## Abstract:

Façades are seldomly used for building detection due to lack of information. In this research a new approach on building façade extraction using airborne oblique images solely is developed. Facades are detected using edge direction and height gradient. The former is carried out on single image while the latter is extracted from an image pair using dense matching. One image pair is sufficient to extract façade facing their viewing direction. Experiments on four directions have shown that the extracted façade are quite reliable, and it can be used for further building detection.

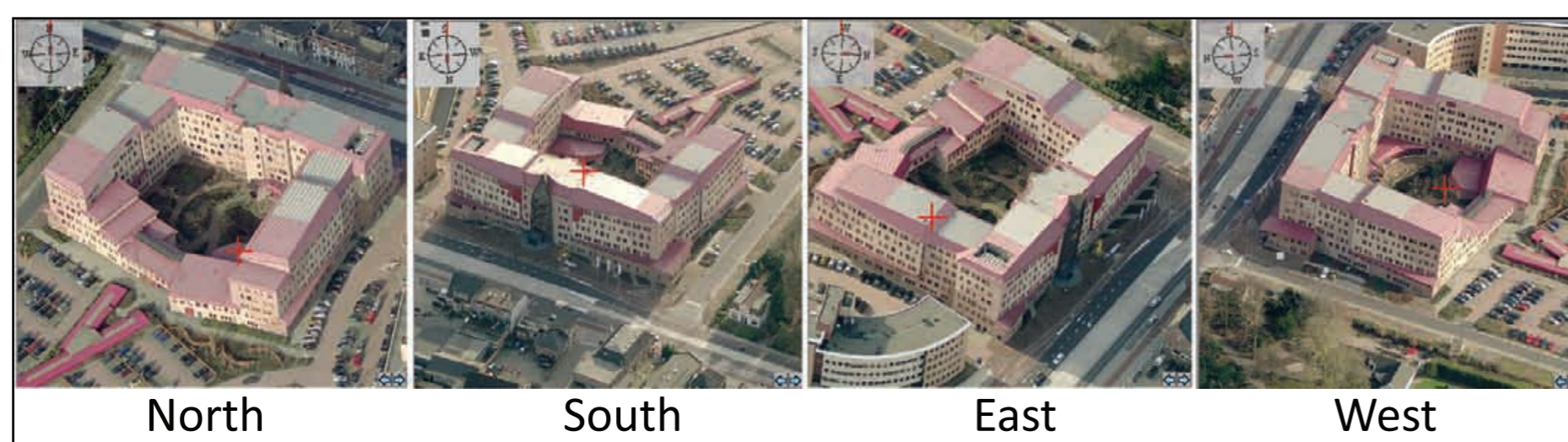
## Motivation:

- Various data sources have been used for building detection, including airborne nadir image(s), DEM (DSM), laser scanner data or imagery with multiple spectral bands.
- But they are all look from above => vertical walls and edges are seldomly used.
- Only a little primary research using image(s) with oblique view in literature.

## Research Objective:

- To develop a method for facade extraction by utilising edge structures in multi-view oblique images;

## Characteristics of oblique images:



- Tilt angle: 40-50 degrees;
- Multiple views from different directions, showing all outer facades;
- Overlap between views, similar or different perspectives;
- (Self-) Occlusion.

## Result from four directions:



All oblique images © Blom

## Main Approaches:

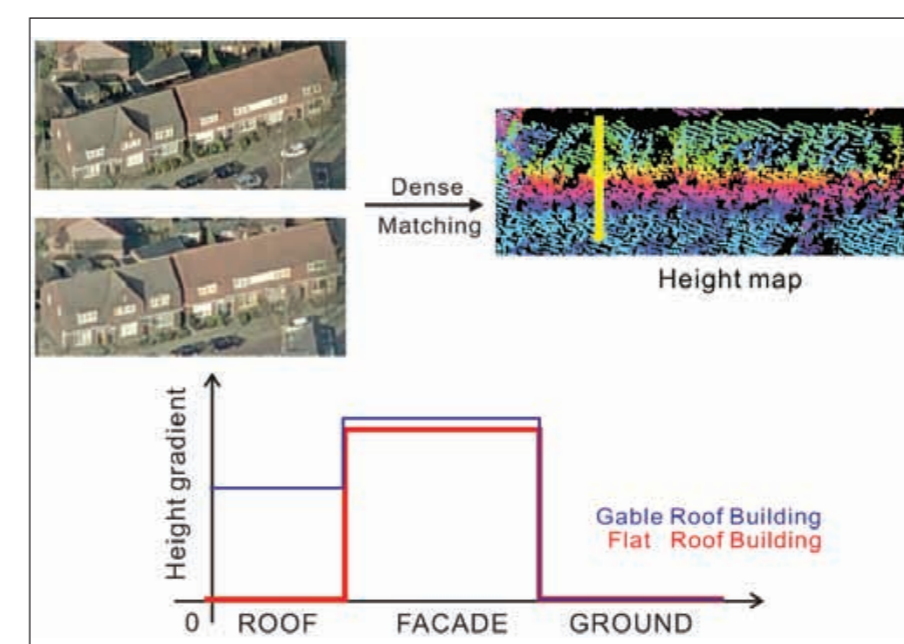
### Texture Evidence

- Plumb lines in object space are still vertical in image space;
- Parallel horizontal lines are still locally parallel;
- Directions of line feature pixels from their gradient matrix.



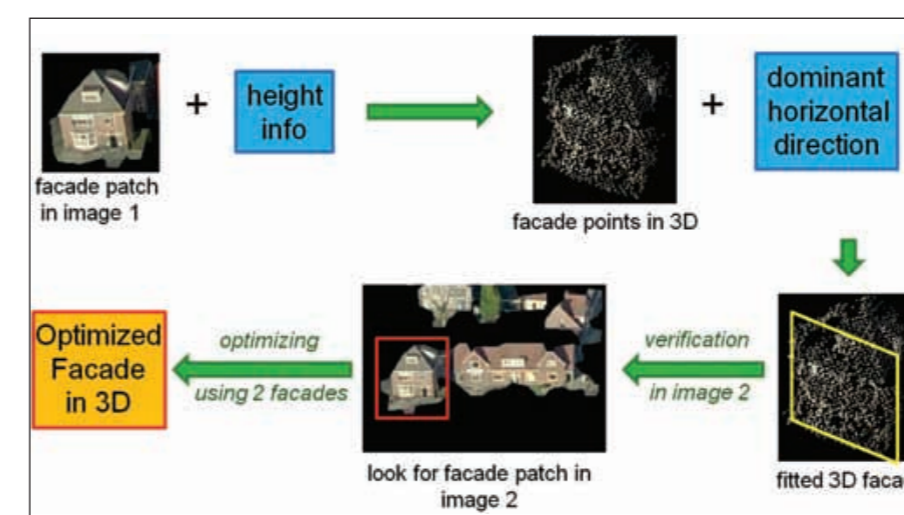
### Height Evidence

Generated by dense matching from image stereo pair



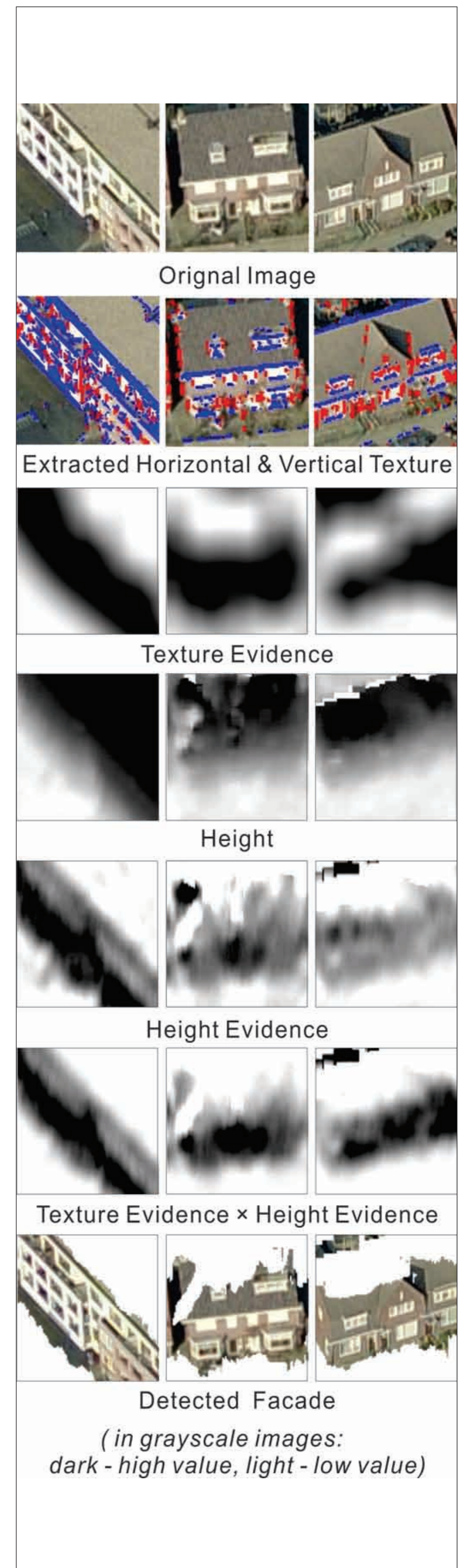
### Detected facade in image

### Facade Verification in 3D



## Conclusion & Outlook:

- Front & back facades are detected successfully; side facades are seldom detected due to lack of texture.
- Innovation: only oblique images, no other data needed.
- Application of the result: automatic building detection.
- Next steps:
  - 1) preliminary building models combining facades from different directions;
  - 2) models verification by integrating image segmentations on roof area from multiple views.



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