Object: Draft for common publi (results + this description < 15 juin)

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Building detection from dataset Vaihingen.

1. DSM
A DSM at 9 cm has been created from the stereo couples of the Vaihingen dataset. The method is described in [Idrissa]. Multiple views were integrated.

2. DTM
To derive the DTM from the DSM, the simple approach based on low percentiles [Beumier] of the Z histogram in a local neighbourhood did not work properly for Area 1 consisting of two different levels. Therefore a new 2-step procedure was developed.
First, ground elements were searched for by looking for large areas of slowly varying elevation, what normally corresponds to terrains or roads. To reject flat roofs, areas whose perimeter is on the average higher than the surrounding zones are discarded. The union of all the remaining areas forms the DTM map. This may contain many holes due to buildings and trees.
Secondly, the DTM map is filled by interpolation. A pyramid of the sparse DTM is created. Starting from the roughest resolution up to the finest ones, a pixel with no DTM value is given a value interpolated from the neighbours of the previous (rougher) level.

3. Building map
Candidate buildings are obtained by thresholding the normalised DSM (nDSM = DSM-DTM) at 2.0m. The zones corresponding to vegetation are discarded by rejecting pixels with NDVI values higher than 0.2. Shadow pixels, often rising difficulties due to wrong NDVI estimation were rejected if their IR value is more than 10% higher than the average of the Red and Green values. Those shadow pixels are detected as the upper limit of the lobe of the darkest histogram peak (preferably in Red or Green channels).

4. Post-processing
The building map typically contains small holes or extra areas, usually caused by shadow casts. The morphological closure with a circular structural element (diameter=1m) and an opening with a circular element (diameter=2m) were applied.

Discussion
The approach runs automatically in about 10 seconds (Intel Core 2 Duo @ 2.33 GHz, 2Gb RAM) for the 4 Mpix images of the test areas. The thresholds were fixed with minimum tuning (a couple of runs), so very little parameter optimisation was applied.

[Idrissa] M. Idrissa, V. Lacroix, “A Multiresolution-MRF Approach for Stereo Dense Disparity Estimation”, In *IEEE-GRSS/ISPRS Joint Urban Remote Sensing Event*, Shanghai, China, 20-22 May 2009.

[Beumier] C. Beumier, "Building Verification from Disparity of Contour Points",
Image Processing Theory, Tools & Applications, IPTA’08, Sousse, Tunisia, 23-26 Nov 2008, pp 408-413.