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Automated mapping of building facades by machine learning

J. Höhle

Aalborg University, Planning, Aalborg, Denmark

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Abstract. Facades of buildings contain various types of objects which have to be recorded for information systems. The article describes a solution for this task focussing on automated classification by means of machine learning techniques.

Stereo pairs of oblique images are used to derive 3D point clouds of buildings. The planes of the buildings are automatically detected. The derived planes are supplemented with a regular grid of points for which the colour values are found in the images. For each grid point of the façade additional attributes are derived from image and object data.

This "intelligent" point cloud is analysed by a decision tree, which is derived from a small training set. The derived decision tree is then used to classify the complete point cloud. To each point of the regular façade grid a class is assigned and a façade plan is mapped by a colour palette representing the different objects. Some image processing methods are applied to improve the appearance of the interpreted façade plot and to extract additional information. The proposed method is tested on facades of a church. Accuracy measures were derived from 140 independent checkpoints, which were randomly selected. When selecting four classes ("window", "stone work", "painted wall", and "vegetation") the overall accuracy is assessed with 80 % (95 % Confidence Interval: 71 %– 88 %). The user accuracy of class "stonework" was assessed with 90 % (95 % CI: 80 %– 97 %). The proposed methodology has a high potential for automation and fast processing.

[Conference Paper](#) (PDF, 846 KB)

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