

ADAPTIVE MORPHOLOGICAL SEGMENTATION – CONCEPTS AND PYTHON IMPLEMENTATIONS

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ABSTRACT:

Segmentation algorithms based on the set theoretical Mathematical Morphology have been successfully applied in geosciences, remote sensing as well as biomedical image analysis. Morphological operators can be conceptualized as non-linear filters, which allow the modelling of spatial relations of pixels in an image, but also of voxels in volumetric data sets such as acquired by LiDAR. However, the iterative trial-and-error parameterization of algorithms, namely the selection of the morphological operator and structuring element, is one of the biggest issues for the transferability of a developed solution to other datasets. In the light of the GEOBIA topics operationalisation and transferability, the paper gives an overview of the fundamental concepts for automated adaption in morphological image segmentation. There are two fundamental concepts to adaptive morphology, which are highlighted. First, approaches that make use of intrinsic image properties such as the pixel location or gray values for the adaption; and second, supervised approaches that automatically adapt and validate the parameters based on a small set of user-provided samples of the expected segmentation result. Both approaches significantly reduce the efforts of manual parameterization as well as the amount of required problem knowledge and thus contribute to the operationalization and transferability of developed segmentation algorithms or image analysis workflows. Finally, examples of ready-to-use Python-based implementations are given, which solely rely on open-source image analysis frameworks.

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