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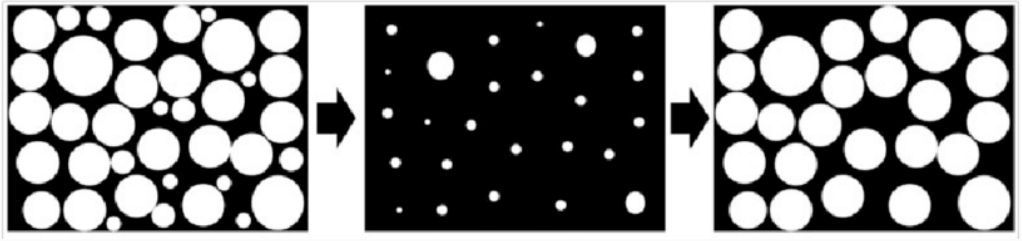
Mathematical Morphology in Digital Soil Mapping

Elevation plays an important role in the production of precise digital soil maps. Digital Elevation Models (DEM) offer a high-resolution depiction of the Earth's surface, enabling researchers to analyze the topography and terrain attributes of a particular region.

Mathematical morphology is a powerful mathematical framework that utilizes algebraic operations to analyze geometrical structures, with diverse applications in areas such as image processing, computer vision, and pattern recognition. One application of mathematical morphology could be the extraction of terrain attributes from DEM. By applying mathematical morphology to a DEM, researchers can extract critical contextual and geometrical information about the Earth's topography. This information can then be used to generate more accurate maps of soil properties.



A mathematical morphology application example for automatically eliminating small image objects

Our research aims to evaluate the effectiveness of mathematical morphology in enhancing soil map accuracy. To accomplish this, we plan to explore the potential of mathematical morphology in extracting terrain attributes from DEM data and using them to produce more accurate soil maps. We are seeking a motivated master's student to undertake this research project, which will involve applying mathematical morphology to DEM data and comparing the resulting soil map with existing maps. This research has the potential to enhance our knowledge of the relationship between terrain attributes and soil properties, as well as to develop more accurate soil mapping techniques.

For this project, previous experience and knowledge in image/signal processing and machine learning would be advantageous. Strong programming skills would also be an important asset to the project. Additionally, writing the final thesis in English would be ideal.

Reference:

1. Benediktsson, Jon Atli, Martino Pesaresi, and Kolbeinn Amason. "Classification and feature extraction for remote sensing images from urban areas based on morphological transformations." *IEEE transactions on geoscience and remote sensing* 41, no. 9 (2003): 1940-1949.

2. Kakhani, Nafiseh, Mehdi Mokhtarzade, and Mohammad Javad Valadan Zoej. "Deep Learning Spatial-Spectral Classification of Remote Sensing Images by Applying Morphology-Based Differential Extinction Profile (DEP)." *Electronics* 10, no. 23 (2021): 2893.

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