Master Thesis in Nonlocal Mathematical Morphology

Background information

Mathematical morphology is a consistent nonlinear theory of image analysis, and a discipline that provides a systematic approach to analyze the characteristics of signals or images. This theory is well founded, where morphological operators can be defined through the framework of complete lattices or through nonlinear partial differential equations. Mathematical morphology has been widely used for different applications, such as object segmentation, image filtering, edge detection, character recognition (OCR), etc. Researchers at Centre for Image Analysis (CBA) actively work on developing new morphological techniques or use mathematical morphology for different applications. Moreover, CBA will host the following 11th International Symposium on Mathematical Morphology that will be held in Uppsala, 27-29 May 2013.

Thesis description

Nonlocal image analysis techniques have recently increased a lot of attention, especially the nonlocal means filter as a powerful filtering method. This filtering method searches for patches at different locations within the image that are similar to the one surrounding the image point being filtered. Following this strategy, nonlocal morphological operators have been recently proposed.
The task for this master thesis is to investigate the previous work on nonlocal mathematical morphology and to develop new nonlocal morphological operators as well as to exhibits the performance of such morphological operators. A comparison with adaptive morphological operators can be considered as well. The student will be able to test all methods on a set of real data, such as images of historical document, images of virus particles as well as on other datasets available at CBA.

Prerequisites

Highly motivated with a strong interest in image analysis and applied mathematics in general.
Good mathematical and programming skills.
Good communication skills in English.

Contact

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