

# Mathematical morphology in image processing by SLD resolution

Gergely Kovásznai and Krisztián Veréb

The Artificial Intelligence researches are in close ties with image processing (e.g., machine vision, robot controlling etc.). But the most of image processing algorithms need imperative solutions. So a question arises, how can such researches be studied using another paradigm in the Artificial Intelligence. The mathematical morphology is one of the most important parts of the image processing used in the image filtering and skeletonization.

So, the question could be defined in the following way: with given digital sets could its eroded and dilated sets be produced using logic programming (e.g. Prolog)? If it is possible, it allows to examine morphology and digital image processing algorithms in the logic programming.

Mathematical morphology stands as a relatively separate part of image analysis. It is based on the algebra of non-linear operators operating on object shape and in many respects surpasses the linear algebraic system of convolution. Morphological operations are used predominantly for image pre-processing (noise filtering, shape simplification), skeletonizing, thinning (enhancing object structure), segmenting object from the background etc.

The main morphological operators are the erosion and dilation, which are based on Minkowski algebra. To answer our main question we create a suitable first-order logical language and formulate the morphological operators as predicates. We transform the formulated problem into an appropriated set of clauses described by a special point-plus form. Since our transformed clauses have a special form, they can be considered as Horn-clauses. That is the reason why we can use SLD-resolution to examine the morphological operators.

In this lecture we show a possible interpretation of the formulated operators mentioned above and particular Prolog codes as well.

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