

MORPHOLOGICAL TRANSFORMATIONS ON FUZZY SETS

Milan LEHOTSKÝ, Ján CHMÚRNY, Technical University, 031 19 Liptovský Mikuláš, Czechoslovakia.

Abstract: The paper deals with basic morphological transformations. Dilation and erosion on fuzzy sets are introduced and their basic properties are shown.

1. Introduction

The basic morphological transformations dilation and erosion are often applied in image processing tasks. They were defined for sets and functions defined on Euclidean and digital spaces and in general on complete lattices. In this paper morphological transformations on fuzzy sets are introduced and it is shown how they differ from the classical dilation and erosion on sets and functions.

2. Dilation and erosion

The basic morphological transformations are defined on complete lattices as follows [1,2]:

Definiton 1: Let L be a complete lattice with 0 as the least element and U as the greatest element. Then the transformation $d:L \rightarrow L$ such that for every $T \subseteq L$ $d(\bigcup T) = \bigcup_{X \in T} d(X)$ is called dilation and the transformation $e:L \rightarrow L$ such that for every $T \subseteq L$ $e(\bigcap T) = \bigcap_{X \in T} e(X)$ is called erosion.

From this definition it can be seen that the dilation is transformation commuting with suprema in L and especially (when T is void) $d(0) = 0$ and the erosion is transformation commuting with infima in L and especially $e(U) = U$.

The following two examples are of the utmost importance for applications of mathematical morphology in image processing.

Example 1: Let L be a set of all subsets of E^2 (E is a set of all real numbers or of all integers) and B a compact sub-