

Image fuzzy segmentation using aggregated distance functions and pixel descriptors

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Abstract

This paper is a review of recent research on image fuzzy segmentation using the fuzzy c-means clustering algorithm based on a distance function constructed by applying the aggregation function on the sequence of the initial distance functions and pixel descriptors. In image segmentation algorithms, distance functions compare pixels and represent a decision criterion for the classification of pixels into image segments. Determination of the segmentation criterion is based on the information fusion process, where the application of the appropriated aggregation function enables the adjustment of the segmentation criteria according to the intuitively expected decision. Initial distance functions represents the basic criteria which are relevant for segmentation, and applied aggregation function represent a model for this basic criteria fusion into one final decision criteria. With regards to a new distance function construction by applying aggregation functions, in this article we present relevant properties of the following aggregation functions: minimum, maximum, weighted arithmetic mean, generalized means, product of powers, weighted arithmetic mean of powers and OWA aggregation functions. Beside the pixel color or color components, other pixel descriptors are important for image segmentation and other image processing tasks. For experimental verification of the methodology used in image segmentation, the fuzzy c-means clustering algorithm is used.

Keywords: Aggregation function, Distance function, OWA aggregation function, Generalized mean, Weighted arithmetic mean of powers, Product of powers, Image, Fuzzy segmentation, Pixel descriptor