

Searching for a globally optimal partition and applications

(Traženje globalno optimalne particije i primjene)

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Abstract. The problem of searching for a globally optimal k -partition of the set $\mathcal{A} \in \mathbb{R}^n$ by using least squares, least absolute deviations and Mahalanobis distance like function is considered. Thereby the objective function is a Lipschitz continuous symmetric function which can have a great number of independent variables, it does not have to be either convex or differentiable, generally it may have several local and global minima and the set \mathcal{A} can consist of many data. Therefore, this becomes a complex global optimization problem. Because of the symmetry property of the objective function, there exist at least $k!$ local and global minimizers. The large number of independent variables and large number of global minimizers make the direct applications of global optimization methods insufficiently efficient.

In case when the data have only one feature, an efficient method (published online: 23 December 2012 in *Journal of Global Optimization*) will be presented.

Also, an efficient method of searching for an approximate globally optimal partition for $\mathcal{A} \in \mathbb{R}^n$ will be presented.

The method will be illustrated on applied research problems by using our own software which is done using *Mathematica*.

Contents:

1. Introduction (Distance-like functions; Some applications; Right number of clusters)
2. Searching for the optimal partition (k-means algorithm; Modification of DIRECT algorithm; Global k-means algorithms)
3. Center-based clustering for line detection with application in crop row detection.