

Accepted Manuscript

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PII: S0950-7051(16)30186-1
DOI: [10.1016/j.knosys.2016.06.023](https://doi.org/10.1016/j.knosys.2016.06.023)
Reference: KNOSYS 3578



To appear in: *Knowledge-Based Systems*

Received date: 6 October 2015
Revised date: 15 June 2016

Please cite this article as: Pham Huy Thong , Le Hoang Son , A Novel Automatic Picture Fuzzy Clustering Method Based On Particle Swarm Optimization and Picture Composite Cardinality, *Knowledge-Based Systems* (2016), doi: [10.1016/j.knosys.2016.06.023](https://doi.org/10.1016/j.knosys.2016.06.023)

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A Novel Automatic Picture Fuzzy Clustering Method Based On Particle Swarm Optimization and Picture Composite Cardinality

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Highlights

- We presented a novel automatic picture fuzzy clustering method called AFC-PFS.
- It automatically determined the most suitable number of clusters for a dataset.
- Picture Composite Cardinality was used for best matching of the number of clusters.
- AFC-PFS created both the most suitable number of clusters and related solutions.
- It produced closest numbers of clusters to real ones.

Abstract: Fuzzy clustering plays an important role in pattern recognition and knowledge discovery. Recently, there has been a great interest of developing fuzzy clustering algorithms on advanced fuzzy sets such as Picture Fuzzy Clustering (FC-PFS) which is an extension of Fuzzy C-Means on Picture Fuzzy Set. A major disadvantage of FC-PFS is how to define a prior number of clusters before clustering. Because each dataset has distinctive features and distributions of patterns, determining such the number for a clustering algorithm would result in good quality. In this paper, we propose a method called Automatic Picture Fuzzy Clustering (AFC-PFS) for determining the most suitable number of clusters for FC-PFS. It is a hybrid method between Particle Swarm Optimization (PSO) and FC-PFS where combined solutions consisting of the number of clusters and equivalent clustering centers and membership matrices are packed and optimized in PSO. A new term namely Picture Composite Cardinality is also given to determine a suitable number of clusters. AFC-PFS is

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