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High order structural matching using dominant cluster analysis.

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Summary: We formulate the problem of high order structural matching by applying dominant cluster analysis (DCA) to a direct product hypergraph (DPH). For brevity we refer to the resulting algorithm as DPH-DCA. The DPH-DCA can be considered as an extension of the game theoretic algorithms presented in [8] from clustering to matching, and also as a reduced version of reduced version of the method of ensembles of affinity relations presented in [6]. The starting point for our method is to construct a K-uniform direct product hypergraph for the two sets of higher-order features to be matched. Each vertex in the direct product hypergraph represents a potential correspondence and the weight on each hyperedge represents the agreement between two K-tuples drawn from the two feature sets. Vertices representing correct assignment tend to form a strongly intra-connected cluster, i.e. a dominant cluster. We evaluate the association of each vertex belonging to the dominant cluster by maximizing an objective function which maintains the K-tuple agreements. The potential correspondences with nonzero association weights are more likely to belong to the dominant cluster than the remaining zero-weighted ones. They are thus selected as correct matchings subject to the one-to-one correspondence constraint. Furthermore, we present a route to improving the matching accuracy by invoking prior knowledge. An experimental evaluation shows that our method outperforms the state-of-the-art high order structural matching methods[10][3].

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