Abstract

This paper proposes a novel technique for a polynomial time algorithm to detect an existence of isomorphism between two unlabeled graphs that is fast and accurate for the mass majority of large random graphs. This technique, namely ppp-Technique, is based on cutting the first graph into large sub-graphs to mimic the pieces (or patches) of a puzzle that have to be patched to their correct places (or matches) on the second graph. It is a difficult process to draw the borders of each patch for best results. In other words, deciding the sizes of the patches is an optimization problem. Clearly, the larger these patches are, the faster the algorithm can decide whether an isomorphism exists. The greedy concept has been applied in the process of creating patches which led to high efficiency. The time complexity of the proposed algorithm is $O(n^3 \log n)$. Examples that clarify the process of constructing the patches from one graph and matching them to the places in the other one are shown. The algorithm is tested with many graphs with different sizes of nodes and different densities of connecting edges which gave complete accurate results.
Graph Isomorphism Algorithm using Pieces Patching Puzzle Technique (ppp - Technique)

References


17. C. McCreeesh, P. Prosser, C. Solnon, and J. Trimble, “When subgraph isomorphism is really hard, and why this matters for graph databases,” Journal of Artificial Intelligence

**Index Terms**

Computer Science  
Algorithms

**Keywords**

Unlabeled Graphs, Random Graphs, Graph Matching, Isomorphism