Graph Isomorphisms

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Friday, April 7 2016

To establish an isomorphic relationship between two independent graphs within polynomial time through the means of the construction of variable rooted trees determined via the breadth first search algorithm.

# introduction

We propose the break down of two potentially graphs into a series of trees, a tree for each vertex, and their mapping to one another, if successful will reveal whether the two graphs are isomorphic. We believe this can be done in polynomial time and would show the graph isomorphism problem exists in the realm of P, not NP.

# THEOREM

We begin by scanning the first graph via a breadth first scan, resulting in a rooted tree. Continue walking over the graph, using the current vertex in the walk as the root of a new BFS and new rooted tree. The BFS worst case scenario is T(n) = O(|E|) = O(bd).Performing this operation over n vertices in the graph is n, resulting in O(n2). There is then, for every tree, n2 operations for comparing the two sets of trees. We assert as a theorem that if, every configuration (rooted tree) of a graph matches the opposing configuration of the opposite graph, then the two graphs are isomorphic. We assert this can be done in polynomial time.