A Recursion on Neighborhood Polynomials and its Applications

Maryam Alipour

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Abstract

The neighborhood polynomial of graph G is the generating function for the number of vertex subsets of G of which the vertices have a common neighbor in G. Here, we investigate the behavior of this polynomial under several graph operations and their generalizations. We provide an explicit formula for the neighborhood polynomial of the graph obtained from a given graph G by vertex attachment. We use this result to propose a recursive algorithm for the calculation of the neighborhood polynomial. Finally, as an application, together with some examples, we prove that the neighborhood polynomial can be calculated in polynomial-time in the class of k-degenerate graphs.