Computing of Graph Expression Lengths by means of Simultaneous Recurrences' Solution

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In our work, we investigate relationships between algebraic expressions and graphs. Using the decomposition method based on revealing various subgraphs of approximately equal sizes in the initial graph, we generate special simultaneous systems of linear nonhomogeneous recurrences for lengths of graph expressions. These systems are characterized by particular restrictions on their coefficients. Specifically, the coefficients equal the numbers of respective subgraphs. Since subgraphs of all types are decomposed into the same numbers of new subgraphs, the sums of coefficients in all recurrences are identical. We propose some techniques that provide closed-form solutions for these systems. Our intent is to determine the class of graphs of regular structure, where the lengths of their expressions can be expressed by these recurrences.

Keywords: graph expression, decomposition, simultaneous system, recurrence, closed form