A graph interpretation of the least squares ranking method

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Abstract

The paper aims at analyzing the least squares ranking method for generalized tournaments with possible missing and multiple paired comparisons. It is shown that the rating vector can be obtained as a limit point of an iterative process based on the scores in almost all cases. The calculation is interpreted on an undirected graph with loops attached to some nodes, revealing that the procedure takes into account not only the results of the given object but also the strength of the objects compared with it. We explore the connection of the method with another rating procedure defined for digraphs, the positional power measure of nodes. The decomposition of the least squares solution offers a lot of ways to extend the method or eliminating its unfavourable properties, such as the violation of self-consistent monotonicity.