

Graph sharing games

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Abstract

Graph sharing games are played on a connected graph with non-negative weights assigned to the vertices. Two players, called Alice and Bob, collect the vertices one by one keeping the taken or the remaining part of the graph (depending on the variant of the game) connected. Each of the players aims at gathering as much weight as possible in total.

These games model a natural situation of two parties competing for valuable resources, where there is no winner or loser, but the result is qualitative. A basic question we can ask for both variants is whether there is a constant $c > 0$ such that Alice has a strategy to gather at least c of the total weight of any graph. We present examples demonstrating that the answer is negative unless additional restrictions are imposed on both the parity of the number of vertices and the structure of the graph on which the game is played. We present classes of graphs for which the answer is positive. Finally, we show how the problem is related to structural graph theory.

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