A New Graph Recoloring Game

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Graph coloring has applications ranging from data storage allocation to event scheduling. The recoloring game introduced in this paper models the addition of a new event to an existing schedule, which corresponds to the addition of a new vertex and incident edges to a previously colored graph. The game pits an attacker, who tries to undo the schedule by successively adding new vertices and incident edges, against a defender, whose role is to assign a color to each new vertex and recolor its neighbors so as to obtain a proper coloring of the whole graph. In this paper, we study the game length of graphs, that is, the number of new vertices that must be added to a graph to create a situation for which there is no response.

Keywords: chromatic number, game length, graph coloring, graph security, vertex expansion.