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Between Burning and Cooling: Liminal Burning on Graphs

Liminal burning generalizes both the burning and cooling processes in graphs. In k -liminal burning, a Saboteur reveals k -sets of vertices in each round, with the goal of extending the length of the game, and the Arsonist must choose sources only within these sets, with the goal of ending the game as soon as possible. The result is a two-player game with the corresponding optimization parameter called the k -liminal burning number. For $k = |V(G)|$, liminal burning is identical to burning, and for $k = 1$, liminal burning is identical to cooling.

Using a variant of Sperner sets, k -liminal burning numbers of hypercubes are studied along with bounds and exact values for various values of k . In particular, we determine the exact cooling number of the n -dimensional hypercube to be n . We analyze liminal burning for several graph families, such as Cartesian grids and products, paths, and graphs whose vertex sets can be decomposed into many components of small diameter.