Guangzhou Discrete Mathematics Seminar

Local coloring and its complexity

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A k-coloring of a graph is an assignment of integers between 1 and k to vertices in the graph such that the endpoints of each edge receive different numbers. We study a local variation of the coloring problem, which imposes further requirements on three vertices: We are not allowed to use two consecutive numbers for a path on three vertices, or three consecutive numbers for a cycle on three vertices. Given a graph G and a positive integer k, the local coloring problem asks for whether G admits a local k-coloring. We give a characterization of graphs admitting local 3-coloring, which implies a simple polynomial-time algorithm for it. Li et al. [Inf. Proc. Letters 130 (2018)] recently showed it is NP-hard when k is an odd number of at least 5, or $k = 4$. We show that it is NP-hard when k is even and $k > 4$, thereby completing the complexity picture of this problem.