On compact edge-colorings: a polynomial time reduction from k-linear to k-cyclic

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Abstract:

An edge-coloring of a graph is an assignment of an integer (called color) to every edge so that adjacent edges get different colors. An edge-coloring that uses k different colors is k-linear compact if the colors incident to every vertex are consecutive in $\{0, \cdots, k-1\}$. The problem k−LCCP is to determine whether a given graph admits a k-linear compact edge coloring. An edge-coloring is k-cyclic compact if there are two positive integers av, bv in $\{0, \cdots, k-1\}$ for every vertex v such that the colors incident to v are exactly $\{av, (av + 1) \bmod k, \cdots, bv\}$. The problem k−CCCP is to determine whether a given graph admits a k-cyclic compact edge coloring. We show that the k−LCCP with possibly imposed or forbidden colors on some edges is polynomially reducible to the k−CCCP when $k \geq 12$, and to the 12−CCCP when $k < 12$.