Some New Results on Conflict-Free Colouring

N.S.Narayanaswamy
Department of Computer Science and Engineering, IIT Madras, Chennai, India.

⎯⎯ Abstract ⎯⎯⎯

We present a polynomial time reduction from the conflict-free colouring problem in hypergraphs to the maximum independent set problem in simple graphs. Specifically, we show that the conflict-free colouring number of a hypergraph with m hyperedges is k if and only if the simple graph output by the reduction, denoted by G_k, has a maximum independent set of size m. We show that the simple graph resulting from this reduction applied to an interval hypergraph with three disjoint intervals is a perfect graph. Based on this, we obtain a polynomial time algorithm to compute a minimum conflict-free colouring of interval hypergraphs, thus solving an open problem due to Cheilaris et al.[1]. We also present another characterization of the conflict-free colouring number in terms of the chromatic number of graphs in an associated family of simple graphs. We use this characterization to prove that for an interval hypergraph the conflict-free colouring number is the minimum partition of its intervals into sets such that each set has an exact hitting set (a hitting set in which each interval is hit exactly once).

⎯⎯ References ⎯⎯

1 Panagiotis Cheilaris, Luisa Gargano, Adele A. Rescigno, and Shakhar Smorodinsky. Strong conflict-free coloring for intervals. *Algorithmica*, 70(4):732–749, December 2014.