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40 Years in Designs: Celebrating the Life and Achievments of
Professor Gholamreza B. Khosrovshahi

Recent Progress in the First-Fit and z-Coloring of Graphs

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Vertex coloring of graphs has broad practical and theoretical importance. Due to the inapproximability of optimal vertex coloring, efficient coloring heuristics are worth studying, acknowledging the fact that every such algorithm has hard-to-color instances. In this talk, we focus on coloring heuristics obtained by using some local recoloring techniques, such as the First-Fit (FF) algorithm and a more sophisticated heuristic invented by the speaker, the so-called z-coloring.

The Grundy number is an invariant that quantifies the worst-case behavior of FF. Only a few classes of graphs are known for which the Grundy number can be determined by a polynomial-time algorithm. We present new families of graphs for which the Grundy number is computed within time complexity O(VE). An approximation algorithm is also presented with an approximation ratio in terms of the girth of the graph. Additionally, some advantages of z-coloring in comparison to FF and b-coloring are discussed. We conclude by introducing some unexplored research problems.