Tight Bounds on the Complexity of Semi-Equitable Coloring of Cubic and Subcubic Graphs

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A $k$-coloring of a graph $G = (V, E)$ is called semi-equitable if there exists a partition of its vertex set into independent subsets $V_1, \ldots, V_k$ in such a way that $|V_i| \notin \{\lceil|V|/k\rceil, \lfloor|V|/k\rfloor\}$ and $|V_i| - |V_j| \leq 1$ for each $i, j = 2, \ldots, k$. The color class $V_1$ is called non-equitable. In the talk we consider the complexity of semi-equitable $k$-coloring, $k \geq 4$, of the vertices of a cubic or subcubic graph $G$. In particular, we show that, given a $n$-vertex subcubic graph $G$ and constants $\epsilon > 0$, $k \geq 4$, it is NP-complete to obtain a semi-equitable $k$-coloring of $G$ whose non-equitable color class is of size $s$ if $s \geq n/3 + \epsilon n$, and it is polynomially solvable if $s \leq n/3$. 