The Signal Detection Problem: Closed Modular Colorings on Grid Graphs

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For a positive integer $k$ and a connected graph $G$, let $c : V(G) \rightarrow \mathbb{Z}_k$ be a vertex coloring where adjacent vertices may be assigned the same color. Then $c$ induces another vertex coloring $c' : V(G) \rightarrow \mathbb{Z}_k$ where $c'(v)$ is the sum (modulo $k$) of the original colors for vertex $v$ and those vertices adjacent to $v$. The coloring $c'$ is called a closed modular coloring of $G$ if adjacent vertices are assigned different colors by $c'$. In this talk, the focus is on grid graphs (also known as lattice graphs or checkerboards) which have applications to cell-phone communication security – such as the signal detection problem. In addition, a computer technique for generating closed modular colorings of grid graphs is discussed.

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