Vertex-Based Distinguishing Collections

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We introduce vertex-based distinguishing collections that generalize locating-dominating sets and other well-studied sets related to sensor placement in a graph. For a graph $G = (V, E)$, a distinguishing collection is a collection of subsets of V, $S = \{S(1), S(2), \ldots, S(t)\}$ such that: $\cap S = V$; and for every distinct pair $u, v \in V$, there is a $k \in \{1, 2, \ldots, t\}$ such that $|S(k) \cup \{u, v\}| = 1$. A vertex-based distinguishing collection is a distinguishing collection S together with a function from S to V. We describe optimization problems on vertex-based distinguishing collections in terms of binary integer programs. Corollaries of the main theorems include the known result $IC(G) \leq 2 \cdot LD(G)$ as well as the new results $OLD(G) \leq 2 \cdot LD(G)$, $OLD(G) \leq 2 \cdot IC(G)$, $IC(G) \leq 2 \cdot OLD(G)$, and $SIC(G) \leq 3 \cdot LD(G)$. The parameters $IC(G)$, $LD(G)$, $OLD(G)$, and $SIC(G)$ are the identifying code number, locating-dominating number, open-locating-dominating number, and strongly identifying code number of graph G, respectively. All of these bounds are sharp.

This talk presents the principle theoretical development and results of the dissertation by Sewell. The work was started with Slater and is an extension of his work on distinguishing collections. Zhang took over as advisor after the passing of Slater. This is the last dissertation guided by Slater, a great advisor, a great friend.

Keywords: distinguishing, locating-domination, identifying code, binary integer programs