Metric dimension in graphs: On a version using distance multisets

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Given a graph G and a subset of vertices $S = \{w_1, \ldots, w_t\} \subseteq V(G)$, the vertex representation of a vertex $u \in V(G)$ with respect to S is the vector $r(u|S) = (d_G(u, w_1), \ldots, d_G(u, w_t))$. A subset of vertices S such that $r(u|S) = r(v|S)$ if and only if $u = v$ for every $u, v \in V(G)$ is said to be a resolving set, and the cardinality of the smallest such set is the metric dimension of G.

On the other hand, the multiset representation of $u \in V(G)$ with respect to S is the multiset $m(u|S) = \{\!\{d_G(u, w_1), \ldots, d_G(u, w_t)\}\!\}$. A set of vertices S such that $m(u|S) = m(v|S)$ if and only if $u = v$ for every $u, v \in V(G) \setminus S$ is said to be a multsiset resolving set, and the cardinality of the smallest such set is the outer multiset dimension of G.

Several results on the metric and outer multiset dimensions of graphs shall be presented in this talk. For instance, the exact value of these parameters for several graph families, and some bounds for other ones, will be shown. It will also be shown that computing the outer multiset dimension of arbitrary graphs is NP-hard, and methods for efficiently handling particular cases are provided.