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How Arbitrary is the Length of a Multiplicity List of a Graph?

Given a simple, undirected graph G on n vertices, let $S(G)$ be the collection of $n \times n$ real symmetric matrices $A = [a_{ij}]$ associated to G satisfying $a_{ij} \neq 0$ if and only if ij (when $i \neq j$) is an edge in G and the main diagonal is free to be chosen. For any square matrix A, let $q(A)$ equal the minimum number of distinct eigenvalues of A. The minimum number of distinct eigenvalues of G is defined as $q(G) = \min\{q(G) : A \in S(G)\}$. A natural question that arises from this association is: Does there exists a matrix $A \in S(G)$ with $q(A) = k$ for every integer k in the interval $[q(G), n]$? Since the inverse eigenvalue problem for graphs has been studied from many angles for years, a general solution seems difficult, so any progress made on subproblems, such as $q(G)$, contributes to an understanding of the whole problem. In this talk, I will discuss some recent progress on this questions for certain classes of graphs.