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Laplacian $\{-1, 0, 1\}$ - and $\{-1, 1\}$ -diagonalizable graphs

A graph is called "Laplacian integral" if the eigenvalues of its Laplacian matrix are all integers. We investigate the subset of these graphs whose Laplacian is furthermore diagonalized by a matrix with entries coming from a fixed set, with particular emphasis on the sets $\{-1, 0, 1\}$ or $\{-1, 1\}$. Such graphs include as special cases the recently-investigated families of "Hadamard-diagonalizable" and "weakly Hadamard-diagonalizable" graphs. As a combinatorial tool to aid in our investigation, we introduce a family of vectors that we call "balanced", which generalize totally balanced partitions, regular sequences, and complete partitions.