Sparse Inertially Arbitrary Sign Patterns

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The inertia of a real matrix A is an ordered triple $i(A) = (n_1, n_2, n_3)$ where n_1 is the number of eigenvalues of A with positive real part, n_2 is the number of eigenvalues of A with negative real part, and n_3 is the number of eigenvalues of A with zero real part. A sign pattern is a matrix whose entries are in $\{+, -, 0\}$. An order n sign pattern S is inertially arbitrary if for every ordered triple (n_1, n_2, n_3) with $n_1 + n_2 + n_3 = n$ there is a real matrix A such that A has sign pattern S and $i(A) = (n_1, n_2, n_3)$. We describe some techniques in determining a pattern is inertially arbitrary. We present some irreducible inertially arbitrary patterns of order n with less than $2n$ entries.