Inertias of Zero-Nonzero Patterns

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Abstract

An n by n zero-nonzero pattern $\mathcal{A}$ is a matrix with entries in $\{*, 0\}$ where $*$ denotes a nonzero real number. If $\mathcal{A}$ allows all $\frac{(n+1)(n+2)}{2}$ possible inertias, then $\mathcal{A}$ is inertially arbitrary. It is shown that there exists a reducible n by n inertially arbitrary zero-nonzero pattern with $2n-1$ nonzero entries for each $n \geq 6$; and that for $n = mt$ with $t \geq 6$ and $m \geq 1$, there exists a reducible n by n inertially arbitrary zero-nonzero pattern with $2n-m$ nonzero entries. These reducible inertially arbitrary zero-nonzero patterns are direct sums of irreducible zero-nonzero patterns, one of which is not inertially arbitrary. Furthermore, for these inertially arbitrary zero-nonzero patterns, it is shown that a superpattern need not be inertially arbitrary, these zero-nonzero patterns do not allow all possible spectra, and there are no inertially arbitrary sign patterns having these zero-nonzero patterns.