

Class: Symmetric Inverse M-Matrices (SIM-Matrices)

Note: Since this class is symmetric, all patterns are positionally symmetric and diagrams are graphs rather than digraphs.

Status: Done

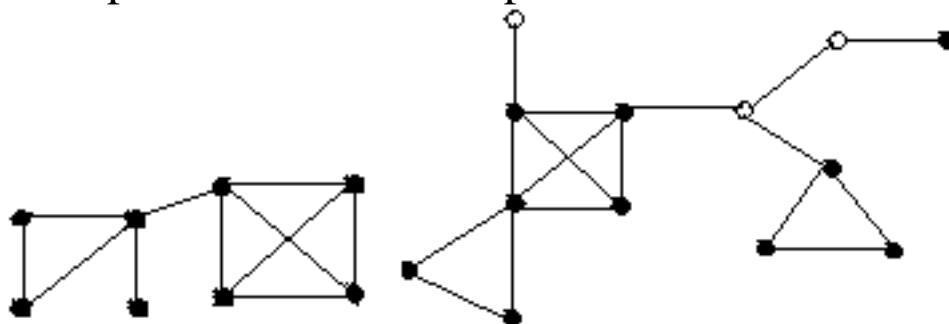
Definitions

- A matrix is a symmetric inverse M-matrix (SIM-matrix) if and only if it is symmetric and it is the inverse of an inverse M-matrix (cf. inverse M-matrix).
- The partial matrix B is a partial SIM-matrix if and only if every fully specified principal submatrix of B is a SIM-matrix, and whenever b_{ij} is specified then so is b_{ji} and $b_{ji} = b_{ij}$, and all specified entries are nonnegative.

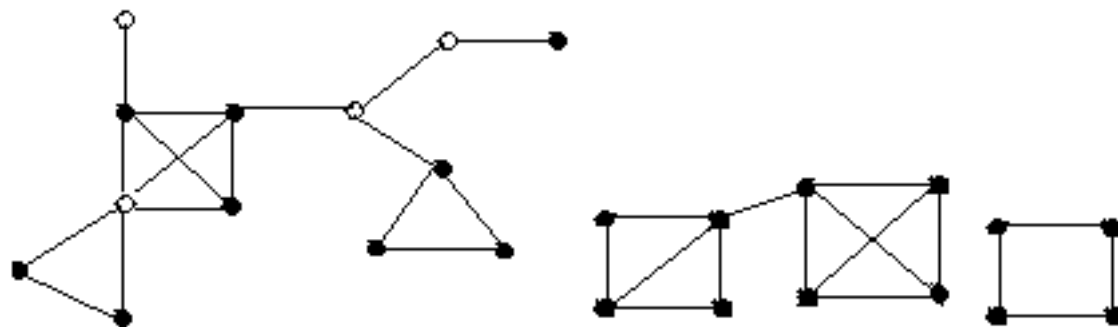
Results:

- A pattern that includes all diagonal positions has SIM-completion if and only if its digraph is block-clique [JS2].
- A pattern has symmetric inverse M-completion if and only if its graph is block-clique and no diagonal position is omitted that corresponds to a vertex in a block of order > 2 [H5].

Examples: Have SIM-completion



Examples: Do not have SIM-completion



References:

- [H5] L. Hogben, The symmetric M-matrix and symmetric inverse M-matrix completion problems, *Linear Algebra and Its Applications* **353** (2002) 159-168, draft available electronically in PDF format at <http://www.math.iastate.edu/lhogben/research/SymMatrixCompletion.pdf>.
- [JS2] C. R. Johnson and R. L. Smith, The symmetric inverse M-matrix completion problem, *Linear Algebra and Its Applications* **290** (1999), 193-212.