

Class: P-Matrices

Status: Positionally symmetric patterns are done. Progress on nonsymmetric patterns.

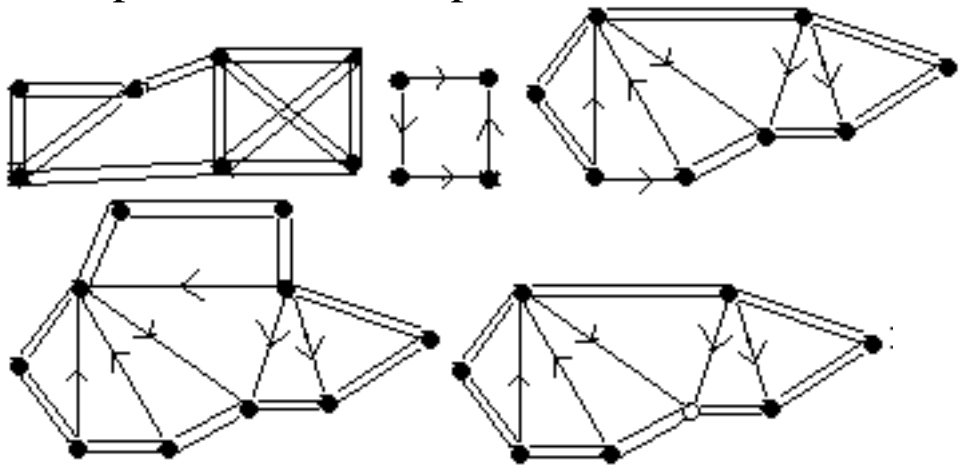
Definitions:

- The matrix A is a P-matrix if and only if every principal minor is positive.
- The matrix B is a partial P-matrix if and only if every fully specified principal submatrix is a P-matrix.

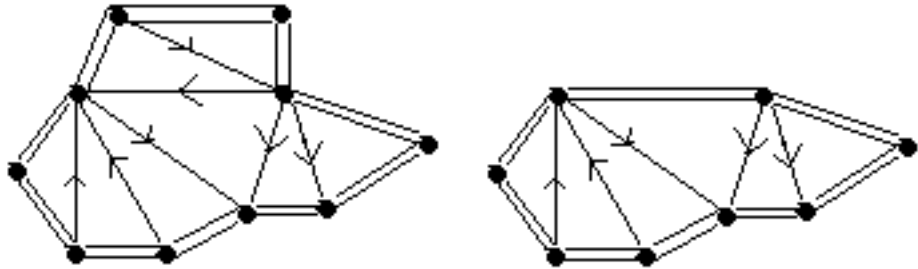
Results:

- A pattern Q (not necessarily positionally symmetric) has P-completion if and only if the principal subpattern determined by the diagonal positions of Q has P-completion [JK].
- Any positionally symmetric pattern Q has P-completion [JK].
- Any pattern for 3×3 matrices has P-completion, but there is a pattern for 4×4 matrices that does not have P-completion [JK].
- Any pattern that can be made positionally symmetric by adding off-diagonal positions one at a time so that each stage only one 2×2 , at most one 3×3 (and no larger) principal subpattern becomes complete, has P-completion [DH].
- A pattern that includes all diagonal positions and whose pattern-digraph is minimally chordal symmetric-Hamiltonian, does not have P-completion [DH].
- The problem of classifying patterns with P-completion reduces to classifying patterns that include the diagonal whose digraphs are strongly connected and nonseparable [H4].
- Any pattern whose mardigraph is asymmetric has P_0 -completion [CDHMW].

Examples: Have P-completion



Examples: Do not have P-completion



References:

- [CDHMW] J. Y. Choi, L. M. DeAlba, L. Hogben, M. S. Maxwell, A. Wangsness, The P_0 -matrix completion problem for patterns, *Electronic Journal of Linear Algebra* **9** (2002), 1-20, <http://www.math.technion.ac.il/iic/ela/toc/9.html>
- [DH] L. DeAlba and L. Hogben, Completions of P-matrix patterns, *Linear Algebra and Its Applications* **319** (2000) 83-102, available electronically in PDF format at <http://www.math.iastate.edu/lhogben/research/PMatrixCompletion.pdf>
- [H4] L. Hogben, Graph theoretic methods for matrix completion problems, *Linear Algebra and Its Applications* **328** (2001) 161-202, available electronically in PDF format at <http://www.math.iastate.edu/lhogben/research/GraphMatrixCompletion.pdf>
- [JK] C. R. Johnson and B. K. Kroschel, The Combinatorially Symmetric P-Matrix Completion Problem, *Electronic Journal of Linear Algebra* **1** (1996), 59-63.