

Solving ...

Seth Chaiken

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0.1 ? Constraint and Generator Duality

0.2 What to solve

(variables) [2]

(?? set some variables to zero)

(set some variables to “inputs”)

(solve for selected variables)

0.3 Matrix Operations

(develop with matrix operations and determinants)

(must relate to Schur complement!)

(must relate to Moore-Penrose inverse!)

0.4 Dependencies

0.5 Extensor Operations

Tie up the stuff about exterior algebra and solving

- Solve for $x(B)$ given $Nx = 0$ and $x(A)$, and when $H : x(A) \rightarrow x(B)$ is a linear map, express $\det(H)$ in terms of minors of N .
- Solve for $x(B)$ given $x = (k^r)N^\perp$ and $x(A)$, and when $H : x(A) \rightarrow x(B)$ is a linear map, express $\det(H)$ in terms of minors of N .

Explain as two dual forms of Cramer’s rule, etc.

(develop same solution with exterior algebra)

(Can we relate this solution to BBR [1]?)

0.6 Jacobi’s Determinant Theorem

(Various theorems in BBR [1])

0.7 Combinatorial Term Cancellation

(my All-Minors paper [3])
(Kirchhoff [4], Maurer [5], ???)
(with extensors...my 1999-2000 work)

References

- [1] Marilena Barnabei, Andrea Brini, and Gian-Carlo Rota. On the exterior calculus of invariant theory. *Journal of Algebra*, 96:120–160, 1985.
- [2] A. Björner, Michel Las Vergnas, B. Sturmfels, N. White, and G. Ziegler. *Oriented Matroids*, volume 46 of *Encyc. Math. and its Appl.* Cambridge Univ. Press, Cambridge, 2nd edition, 1999.
- [3] Seth Chaiken. A combinatorial proof of the all minors matrix tree theorem. *SIAM J. Alg. Disc. Meth.*, 3:319–329, 1982.
- [4] G. Kirchhoff. Über die auflösung der gleichungen, auf welshe man bei der untersuchung der linearen verteilung galvanischer ströme gefuhrt wird. *Ann. Physik Chemie*, 72:497–508, 1847. On the solution of the equations obtained from the investigation of the linear distribution of Galvanic currents, (J. B. O’Toole, tr.) *IRE Trans. Circuit Theory*, 5, 1958, pp. 238–249.
- [5] S. B. Maurer. Matrix generalizations of some theorems on trees, cycles and cocycles in graphs. *SIAM J. Appl. Math.*, 30:143–148, 1976.