Revisiting rapid elliptic solvers with matrix functions

E. Gallopoulos
Computer Engineering and Informatics Department
Patras, Greece

stratis@ceid.upatras.gr

Rapid elliptic solvers were some of the earliest examples of very useful structured linear algebra, both for direct use as well as for preconditioning. Moreover, they inspired effective schemes for parallel computation and ideas for balancing stability with parallelism. In this presentation we consider some old workhorses, including variants of cyclic reduction and FFT-based matrix decomposition ([1]) and revisit techniques from ([2, 3]) based on matrix functions in order to reveal interesting connections between parallel schemes.

References

[1] B. Buzbee, G. Golub, and C. Nielson. On direct methods for solving Poisson's equation. *SIAM J. Numer. Anal.*, 7(4):627–656, December 1970.

[2] E. Gallopoulos and Y. Saad. Some fast elliptic solvers for parallel architectures and their complexities. *Int'l. J. High Speed Computing*, 1(1):113–141, May 1989.

[3] H.T. Kung. New algorithms and lower bounds for the parallel evaluation of certain rational expressions and recurrences. *J. Assoc. Comput. Mach.*, 23(2):252–261, April 1976.