Algebraic updates of preconditioners for solving similar linear algebraic systems

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Many applications like computational fluid dynamics, structural mechanics and numerical optimization provide sequences of systems of linear algebraic equations with similar coefficient matrices. For example, such systems can arise as a result of a nonlinear iteration.

The talk will deal with algebraic updates of approximations to the system matrices which may make computation of subsequent preconditioners more efficient. One possible approach is to exploit an approximate pattern to get the new preconditioner [3]. Another possibility is to directly update the old preconditioner based on one of more alternative strategies. In particular, we will generalize the approaches from [1] and [2]. We will present some possible algorithmic procedures and numerical experience with them.

[1] M. Benzi and D. Bertaccini. Approximate inverse preconditioning for shifted linear systems. *BIT Numerical Mathematics,* 43 (2003), 231–244.

[2] D. Bertaccini. Efficient preconditioning for sequences of parametric complex symmetric linear systems. *Electronic Transactions on Numerical Mathematics,* 18 (2004), 49–64.

[3] J. Cullum and M. Tůma. Matrix-free preconditioning using partial matrix estimation. *Technical report V-898, Institute of Computer Science, Academy of Sciences of the Czech Republic,* 2003, submitted.