LOW-RANK UPDATES AND DIVIDE-AND-CONQUER METHODS FOR MATRIX EQUATIONS

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Linear and quadratic matrix equations, such as the Sylvester and Riccati equations, play an important role in various applications, including the stability analysis and dimensionality reduction of linear dynamical control systems and the solution of partial differential equations. In this talk, we present algorithms for quickly updating the solution of such a matrix equation when its coefficients undergo low-rank changes. We demonstrate how our algorithm can be utilized, including the derivation of a new divide-and-conquer approach for matrix equations that feature hierarchical low-rank structure, such as HODLR, HSS, and banded matrices. Numerical experiments demonstrate the advantages of divide-and-conquer over existing approaches, in terms of computational time and memory consumption.

This talk is based on [1, 2].

References

[1] D. Kressner, P. Kürschner, and S. Massei, *Low-rank updates and divide-and-conquer methods for quadratic matrix equations*, in preparation.

[2] D. Kressner, S. Massei, and L. Robol, *Low-rank updates and a divide-and-conquer method for linear matrix equations*, arXiv:1712.04349, 2017.