

Solving bordered almost block diagonal systems

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Almost block diagonal (ABD) linear systems arise in the discretization of boundary value problems in differential equations when there are separated boundary conditions, e.g. for problems with Dirichlet boundary conditions. When the boundary conditions are non-separated, e.g. for periodic boundary conditions, the corresponding system is bordered almost block diagonal (BABD). We show by example why the standard Gaussian elimination algorithm when used to solve a BABD system might fail, and we consider alternative algorithms which work with the BABD structure. We discuss the performance of the MATLAB dense and sparse linear system library functions on this BABD problem. Finally, we show how to convert a BABD system to a larger ABD system and discuss the use of standard and specially designed ABD algorithms for this transformed system.