## EFFICIENT IMPLEMENTATION OF LARGE SCALE LYAPUNOV AND RICCATI EQUATION SOLVERS

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## Abstract

The Newton-ADI-method has shown to be an efficient tool for the solution of large scale sparse Lyapunov and Riccati matrix equations. The Lyapack software package has obtained acceptance as a valuable and efficient MATLAB tool implementing this method. Since its application in PDE control often involves usage of the MATLAB mex interface, thus producing a noticeable overhead especially in large scale, one is interested in applying the Newton-ADI-method directly using the matrix multiplication and solver routines from the chosen PDE solver library or toolbox. Here we want to compare a C implementation of the Newton-ADI-method with the Lyapack version. We also implement some improvements for the case where underlying system involves a mass matrix  $(M\dot{x} = Ax + Bu)$  regarding the transformation of these systems to standard form  $(\dot{x} = \tilde{A}\tilde{x} + \tilde{B}u)$ . Furthermore we discuss variants of the Newton-ADI-method that may lead to improvements in computational time and memory usage for practical applications.

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