Master Thesis

In my master thesis the nonlinear matrix equations $X \pm A^*X^{-k}A = I$ for k = 1, 2 where I is the $n \times n$ unit matrix and A is $n \times n$ invertible matrix are considered. This kind of equations arise in dynamic programming, stochastic filtering, control theory and statistics.

Iterative methods for computing positive definite solutions of the above equations are constructed. Necessary and sufficient conditions for the existence of positive definite solutions of this equations are given. Sufficient conditions for the existence of maximal and minimal solutions of the equations $X + A^*X^{-1}A = I$ are presented. The effectiveness of the proposed methods is discussed in several different examples. Numerical experiments corroborating the theoretical results are also presented.

The main results of my master thesis are published in:

• Ivanov I., Hasanov V., Minchev B., On matrix equations $X \pm A^* X^{-2} A = I$, Linear Algebra Appl., **326**, p. 27-44.