

Theory of Krylov subspace methods

Lecture in the Summer Semester 2014

Prof. Jörg Liesen (11.03.2014)

Time: Wednesday 14-16 (starting 16.04.2014)

Room: MA 742

LP: 5 (2 SWS)

Language: English

The module description (see my homepage: www.math.tu-berlin.de/?78578) gives some details on the content of the lecture and background literature. In addition, the following description gives an overview of the plan for this semester:

We will start with the general projection-based framework for Krylov subspace methods. Within this framework we will derive the major methods CG, SYMMLQ, MINRES and GMRES with their orthogonality and optimality properties. We will then focus on the GMRES method for solving general, nonsymmetric (or non-Hermitian) linear algebraic systems. The properties of this method in exact and finite precision arithmetic will be discussed in detail.

The lectures will be based on the monograph [1] as well as a number of recently published articles. Our goal is to present the state-of-the-art in the analysis of the GMRES method. The results can be of interest to anyone working in numerical mathematics and particularly on the numerical solution of linear algebraic problems such as linear algebraic systems, eigenvalue problems, or least squares problems.

[1] J. Liesen and Z. Strakoš, *Krylov Subspace Methods. Principles and Analysis*, Oxford University Press, Oxford, UK, 2013.

Prerequisites: The lecture is intended for Master and PhD students as well as *advanced* Bachelor students. Required prerequisites are: Lineare Algebra I+II, Analysis I+II, Numerische Mathematik I (possibly II) and Numerische Lineare Algebra I.