A Padé family of iterations for the matrix sector function

Beata Laszkiewicz[1] **and Krystyna Ziętak**[2]

[1]*State Higher Professional School, Jelenia Góra, Poland*
[2]*Wrocław University of Technology, Poland*

Abstract

The *matrix sector function* was introduced by Shieh, Tsay and Wang as a generalization of the matrix sign function. For a nonsingular matrix $A \in \mathbb{C}^{n\times n}$ it is defined as follows:

$$\operatorname{sect}_p(A) = A(\sqrt[p]{A^p})^{-1},$$

where $\sqrt[p]{X}$ denotes the principal matrix pth root of X.

The matrix sector function can be defined in terms of the Jordan canonical form of A, but it is not suitable for computations. In the talk we deal with the Padé family of iterations for computing the matrix sector function, that generalizes a result of Kenney and Laub for the matrix sign function. The convergence of the Padé iterations for the matrix sector function is investigated. Our attention is also drawn to the structure preservation by the principal Padé iterations (from the main diagonal of the Padé table).

Additionally we show how the presented methods can be extended to obtain a family of iterative methods for computing the matrix pth root.

Keywords

Matrix sector function, Matrix pth root, Padé approximation, Structure preservation.