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Block triangular miniversal deformations of matrices and matrix pencils

This is joint work with Vladimir V. Sergeichuk.

The reduction of a matrix to its Jordan form is an unstable operation: both the Jordan form and the reduction transformations depend discontinuously on the entries of the original matrix. Therefore, if the entries of a matrix are known only approximately, then it is unwise to reduce it to Jordan form. Furthermore, when investigating a family of matrices smoothly depending on parameters, then although each individual matrix can be reduced to its Jordan form, it is unwise to do so since in such an operation the smoothness relative to the parameters is lost.

For these reasons, Arnold [1] constructed a *miniversal deformation* of any Jordan canonical matrix J; that is, a family of matrices in a neighborhood of J with the minimal number of parameters, to which all matrices M close to J can be reduced by similarity transformations that smoothly depend on the entries of M

Analogous miniversal deformations were also constructed for families of complex matrix pencils by Edelman, Elmroth, and Kågström [2], and contragredient matrix pencils (they reduce by transformations $(A, B) \mapsto (S^{-1}AR, R^{-1}BS)$) by Garcia-Planas and Sergeichuk [3].

We give other miniversal deformations for families of matrices, matrix pencils, and contragredient matrix pencils; our miniversal deformations are block triangular.

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[2] Edelman A., Elmroth E., Kågström B. // Siam J. Matrix Anal. Appl. — 1997. — **18**, N 3.

[3] Garcia-Planas M. I., Sergeichuk V. V. // Linear Algebra Appl. — 1999. — **302**.