FINITE AND INFINITE STRUCTURES OF RATIONAL MATRICES:
A LOCAL APPROACH

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Abstract. The structure of a rational matrix is given by its Smith-McMillan invariants. Some properties of the Smith-McMillan invariants of rational matrices with elements in different principal ideal domains are presented: In the ring of polynomials in one indeterminate (global structure), in the local ring at an irreducible polynomial (local structure), and in the ring of proper rational functions (infinite structure). Furthermore, the change of the finite (global and local) and infinite structures is studied when performing a M"obius transformation on a rational matrix. The results are applied to define an equivalence relation in the set of polynomial matrices, with no restriction on size, for which a complete system of invariants are the finite and infinite elementary divisors.

Key words. Rational matrices, Polynomial matrices, Smith-McMillan form, Finite and infinite structures, Localization, M"obius transformations.

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