On Newton interpolating series and their applications

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Newton interpolating series are constructed by means of Newton interpolating polynomials with coefficients in an arbitrary field K (see Section 1). If $K = \mathbb{C}$ is the field of complex numbers with the ordinary absolute value, particular convergent series of this form were used in number theory to prove the transcendence of some values of exponential series (see Theorem 1). Moreover, if $K = \mathbb{R}$, by means of these series it can be obtained solutions of a multipoint boundary value problem for a linear ordinary differential equation (see Theorem 2). If $K = \mathbb{C}_p$, some particular convergent series of this type (so-called Mahler series) are used to represent all continuous functions from $\mathbb{Z}_p$ in $\mathbb{C}_p$ (see [4]).

For an arbitrary field K, with respect to suitable addition and multiplication of two elements the set of Newton interpolating series becomes a commutative K-algebra $K_S[[X]]$ which generalizes the canonical K-algebra of formal power series. If we consider K a local field, we construct a subalgebra of $K_S[[X]]$, even for more variables, which is a generalization of Tate algebra used in rigid analytic geometry (see Section 3).

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