Sharp algebraic periodicity conditions for linear higher order difference equations

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It will be derived new necessary and sufficient, and sufficient algebraic conditions on the periodicity of the solutions of the d-dimensional system of the sth order difference equations

$$x(n) = \sum_{i=1}^{s} A_i(n)x(n-i), \quad n \geq 0,$$

where

(C_1) $s \geq 1$ is a given integer, and $A_i(n) \in \mathbb{R}^{d \times d}$ for every $1 \leq i \leq s$ and $n \geq 0$.

The main tool in our investigation is a transformation, recently introduced by Győri and Horváth in [1], which formulates a given higher order recursion as a first order difference equation in the phase space. The periodicity conditions are formulated in terms of the so called companion matrices and the coefficients of the given higher order equation, as well (see [2]).

References

[1] I. Győri, L. Horváth, A new view of the l^p-theory for system of higher order difference equations, Comput. Math. Appl. 59 (2010) 4205-4216.

[2] I. Győri, L. Horváth, Sharp algebraic periodicity conditions for linear higher order difference equations, Comput. Math. Appl., http://dx.doi.org/10.1016/j.camwa.2012.02.018