Matrix theory and the solvability of nonlinear difference equations

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In this talk we study 2n-th order discrete boundary value problems. We concentrate on main differences with their continuous counterparts. In contrast to published work, we exploit the finite dimension of function spaces and some simple results from matrix theory to construct a nonlinear equation in \mathbb{R}^N which is eventually studied with the degree theory and simple variational methods. Existence and uniqueness theorems, which are obtained in this way, improve the existing results (even in the second-order case) by including non-continuous right-hand sides, higher-order problems and non-invertible difference operators.