Existence of solutions to nonlinear 2nth-order discrete boundary value problem via variational methods

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We consider the boundary value problem for the 2nth-order difference equation of the form

$$\Delta^n(p(t-n)\Delta^n x(t-n)) + f(t, x(t)) = 0,$$

where $t \in [1, T]_{\mathbb{Z}}$ and $\Delta^k x(1-n) = \Delta^k x(T-n+1)$, $k = 0, 1, \ldots, 2n-1$. Basis on the variational methods we obtained the existence theorems for this equation. The main results are illustrated by a few examples.

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