Thandapani, E.; Balasubramanian, V.
Some oscillation results for second order neutral type difference equations. (English)
Zbl 1284.39012

This paper deals with the second-order neutral difference equation

$$
\Delta \left( a_n \left[ \Delta (x_n + p_n x_{\tau(n)}) \right]^\alpha \right) + q_n f(x_{\sigma(n+1)}) = 0,
$$

where $$n \geq n_0 \in \mathbb{N}$$ and $$\{\tau(n)\}_{n=n_0}^\infty$$ and $$\{\sigma(n)\}_{n=n_0}^\infty$$ are increasing integer sequences. Four special cases are considered: (i) $$\tau(n) \geq n$$ and $$\sigma(n+1) \leq n$$, (ii) $$\sigma(n) \geq \tau(n) \geq n$$, (iii) $$\sigma(n+1) \leq \tau(n) \leq n$$, and (iv) $$\tau(n) \leq n$$ and $$\sigma(n+1) \geq n$$. For each case, the authors prove an oscillation criterion for solutions satisfying $$\sup\{|x_n|, \ n \geq N\} > 0$$ for all $$N \geq n_0$$. These criteria improve the results of E. Thandapani and S. Selvarangam [“Oscillation theorems of second-order quasilinear neutral difference equations”, J. Math. Comput. Sci. 2, No. 4, 866–879 (2012)], where an additional condition (that $$\sigma$$ and $$\tau$$ commute) was assumed.

Reviewer: Roman Šimon Hilscher (Brno)

MSC:
39A21 Oscillation theory for difference equations
39A10 Additive difference equations
39A12 Discrete version of topics in analysis
34K40 Neutral functional-differential equations

Keywords:
oscillation; second-order neutral difference equation

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