

Discrete Oscillation Theory

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As a starting point, let us consider the second order difference equation

$$(1) \quad \Delta(r_k \Delta x_k) + c_k x_{k+1} = 0, \quad \Delta x_k := x_{k+1} - x_k$$

with real-valued sequences r_k, c_k and $r_k \neq 0$. Oscillation theory of (1) is deeply developed and it is very similar to the oscillation theory of the Sturm-Liouville differential equation

$$(r(t)x')' + c(t)x = 0, \quad r(t) > 0.$$

We will discuss problems in extending oscillation theory of (1) to other difference equations and systems. A particular attention will be devoted to the comparison of the discrete and continuous cases, i.e., to the comparison of oscillation theory for difference and differential equations.