Two-parameters formulas for general solution to planar weakly delayed linear discrete systems with multiple delays, equivalent non-delayed systems, and conditional stability

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Weakly delayed planar linear discrete systems with multiple delays

$$x(k+1) = Dx(k) + \sum_{l=1}^{n} H^l x(k-m_l), \quad k = 0, 1, \dots$$

are considered where $0 < m_1 < m_2 < \cdots < m_n$ are fixed integers, D, H^1, $\dots$, H^n are nonzero 2×2 real constant matrices and $x\colon \{-m_n, -m_n+1, \dots\} \to \mathbb{R}^2$. Formulas for general solutions are found and simplified, equivalent non-delayed planar linear discrete systems are constructed and conditional stability is analyzed. Results are illustrated by examples.

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