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Morphic Words and Nested Recurrence Relations

In "Gödel, Escher, Bach: An Eternal Golden Braid," Douglas Hofstadter introduces his famous recurrence $G(n) = n - G(G(n-1))$ with $G(1) = 1$. He writes of his surprising discovery of a highly structured infinite tree generated by the values of $G(n)$.

We introduce a new family of nested recurrences which generalize Hofstadter's G sequence. We analyze these recurrences by recasting his tree interpretation in terms of morphic words over a countable alphabet and applying known results on such words. We present some intriguing examples, and make connections to some well-known sequences including the Conolly and Tanny sequences and the Thue-Morse sequence. (Joint work with Frank Ruskey)