Combinatorial interpretations of bi-periodic Horadam sequences

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In this talk, we consider a generalization of Fibonacci sequence, called as bi-periodic Horadam sequence $\{w_n\}$, which is defined by the recurrence relation:

$$w_n = a^{\xi(n+1)} b^{\xi(n)} w_{n-1} + c w_{n-2}, \ n \geq 2,$$

with arbitrary initial values w_0, w_1 and nonzero real numbers a, b, c. Here $\xi(n) = [1 - (-1)^n]/2$, that is, $\xi(n) = 0$ when n is even and $\xi(n) = 1$ when n is odd. This sequence is a natural generalization of the classical Horadam sequence when $a = b$. Also, when $a = b = c = 1$ and $w_0 = 0, w_1 = 1$, the bi-periodic Horadam sequence reduces to the classical Fibonacci sequence. We provide a combinatorial interpretation for the bi-periodic Horadam numbers. Furthermore, we introduce bi-periodic incomplete Horadam numbers and bi-periodic hyper Horadam numbers, and give a relationship between them.