

Kolam-Inspired Frequency Hopping: An Innovative Approach for Interference Reduction in Wireless Communication

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Abstract: *The integration of cultural patterns into engineering applications opens new avenues for innovation and efficiency. This research explores the application of Kolam patterns, a traditional Indian art form characterized by its symmetry and periodicity, in frequency hopping for wireless communication systems. Kolam-inspired frequency hopping sequences are designed and compared with conventional pseudorandom sequences using key performance metrics, including Bit Error Rate (BER) and Signal-to-Interference Ratio (SIR). Simulations conducted under varying conditions of frequencies, number of users, hops, and Signal-to-Noise Ratio (SNR) reveal that Kolam-based sequences demonstrate superior interference management and lower error rates. The results underscore the potential of Kolam patterns to improve spectral efficiency and reliability in modern communication networks. This study paves the way for further exploration of cultural and mathematical patterns in optimizing wireless technologies.*

Keywords: Kolam Patterns, Frequency Hopping, wireless communication, Bit Error rate, Signal to Interference Ratio, Symmetry and periodicity, Interference Management