
SYNCHRONIZATION OF QUATERNION VALUED NEURAL NETWORKS: APPLICATION IN SECURE COMMUNICATION

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ABSTRACT

This study investigates projective synchronization (PS) and function projective synchronization (FPS) for quaternion-valued inertial neural networks (QVINNs) with generalized delays. A novel generalized delay-based lemma is developed to establish synchronization criteria, and suitable controllers are designed to ensure the realization of PS and FPS between the drive and response systems. By employing the one-norm technique and Lyapunov stability theory, sufficient synchronization conditions are derived for the considered systems. The proposed framework effectively reduces computational complexity and simplifies the analytical procedure while maintaining rigorous synchronization performance. Furthermore, an audio encryption and decryption scheme based on synchronization and a random permutation matrix is developed. Numerical simulations are provided to demonstrate the validity and effectiveness of the theoretical results and the proposed encryption approach. .

Keywords Inertial neural networks(INNs) · Projective synchronization(PS) · Function projective synchronization(FPS) · Generalized time delays · Secure communications

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