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## Broadcast Gossip Ratio Consensus: Asynchronous Distributed Averaging in Strongly Connected Networks

### Abstract:

This study proposes a gossip-based algorithm to find the exact average of initial states in strongly connected topologies such as sensor networks. Network members are assumed to have different clock rates where the arrival of a clock tick is a Poisson process with a rate  $\lambda$ . The algorithm reaches a consensus value faster and with fewer packet transmissions by tolerating omissions of low-rate members' states. Theoretical analysis is provided to demonstrate that the final consensus value converges to the exact average of initial measurements regardless of the rates of transmission. Additionally, it is shown that the proposed algorithm asymptotically reaches a consensus value even if some algorithm parameters are not precisely measured. Simulation results in a realistic environment confirm that the proposed framework needs considerably fewer packet transmissions than existing methods. The algorithm maintains its excellence in terms of transmission count, convergence speed and accuracy for different network sizes and transmission rates.