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Tensor-Based Computational Methods for Multiscale Spatial Models of Avian Influenza

Avian influenza involves complex interactions between multiple host populations, environmental processes, and spatial transmission. These interactions can lead to high-dimensional computational models that are challenging to simulate efficiently. In this work, we investigate tensor-based computational methods for the efficient representation and numerical solution of multiscale spatial models of avian influenza. Tensor decompositions are used to reduce the computational and storage requirements associated with high-dimensional model representations while preserving the main features of the underlying dynamics. The approach is designed to support parallel computation and large-scale numerical simulations. Numerical experiments will examine accuracy, computational efficiency, scalability, and the effect of spatial and temporal scales on the resulting simulations. The proposed framework provides a computational approach for studying complex spatial transmission dynamics and may contribute to more efficient simulation and data-informed analysis of avian influenza.