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Monte Carlo simulation and linear stability analysis of Turing pattern formation in noisy reaction-subdiffusion systems KENG-HWEE CHIAM, A*STAR Institute of High Performance Computing, JIAWEI CHIU, MIT — Subdiffusion is an important physical phenomenon observed in many systems. However, numerical techniques to study it, especially when coupled to noisy reactions, are lacking. In this talk, we develop an efficient Monte Carlo algorithm based on the Gillespie algorithm and the continuous-time random walk to simulate noisy reaction-subdiffusion systems. Using this algorithm, we investigate Turing pattern formation in the Schnakenberg model with subdiffusion. First, we show that, as the system becomes more subdiffusive, the homogeneous state becomes more difficult to destablize and Turing patterns form less easily. Second, we show that, as the number of particles in the system decreases, the magnitude of noise increases and again the Turing patterns form less easily. Third, we show that, as the system becomes more subdiffusive, the ratio between the two diffusive constants must be higher in order to observe Turing patterns. Finally, we also carry out linear stability analysis to validate the results obtained from our algorithm.

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