[Talk 15] Role of Bias in Generalized Contact Process

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We present a generalized contact process (GCP), which is a one-dimensional CP-based cyclically coupled model with power-law lifetime and branching bias. The feedback of power-law lifetime is controlled by not only memeroy strength and but also power-law tail exponent. In the absence of braching bias*†*, it has been reported that the long-term memory caused by the feedback of lifetime, exhibits continuous varying critical behaviors, which is quite similar to the long-term memory effect by solidary particles in the pair CP with diffusion (PCPD) as the possibility of the new universality class. Among various scenarios and controversial issues suggested based on numerical and field-theoretical results, the relevance of external driving bias and the crossover exponent analysis of critical properties in the PCPD*‡* strongly support that the PCPD does not belong to the directed percolation (DP) unversality class because the external driving bias is irrelevant to the DP or the directed Ising (or parity conservation) universality class and the phase boundary is discontinuous at zero diffusion rate. In this study, we discuss how the long-term memory of power-law lifetime plays a crucial role in the continuous varying critical behaviors of the GCP. By introducing the branching bias, we show that the external driving is also relevant to the GCP, like the driven PCPD. Finally, we argue that the GCP universality class is also new, which is numerically tested up to the mean-field GCP.

† M. Ha, H. Park, S.Kwon, and H. Park (KIAS preprint unpublished data).
‡ S.-C. Park, Phys. Rev. E **90**, 052115 (2014); S.-C. Park and H. Park, Phys. Rev. Lett. **94**, 065701 (2005).