Understanding the emergence of critical phenomena in discontinuous percolation transition through cluster merging dynamics.

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Hybrid percolation transition (HPT) exhibits not only discontinuous jump of the order parameter but also critical phenomena likewise power-law of the cluster size distribution. Recently such characteristics of HPT have been discovered in a grand-scale power outages or outbreaks of contagious diseases, the study to understand how HPT occurs and the theory for analysis of critical phenomena of HPT are receiving attention. Here, we introduce the restricted percolation (r-percolation) model which is known to shows HPT. The rule of r-percolation model promotes small clusters in set R to grow and suppresses large clusters in set R^C to merge, in the meantime the event occurs when the cluster merges and moves another set. We measure the inter-event time and find the distribution of the inter-event time follows a power-law. This self-organized behavior will be beginning of understanding the emergence of critical phenomena in HTP.