[P8] Morphological transition of innovation-propagation model in high-dimensions

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We study the morphological transition in innovation-propagation model on high dimensional substrates including complex networks. The diversity of technological level is investigated through the scaling behavior of width, $W(N;t)$, which represents the mean-square-root of the technological level of *N* agents. From the numerical simulations, we find that there are two phases, the at ordered phase and smooth disordered phase when $d \geq 2$. In the at ordered phase most of the agents have the same technological level and the steady-state value of $W(N;t)$, $W_{sat}(N)$ scales as $W_{sat}(N) \sim N^{-1/2}$. However, when the system is in a smooth disordered phase, the value of $W_{sat}(N)$ is independent of *N*. The observed behaviors are completely different from those on a one-dimensional lattice in which the model undergoes a transition from a smooth ordered phase to a rough disordered phase. By considering the effect of the underlying topology on the propagation dynamics for $d \geq 2$, we derive $W_{sat}(N)$ using mean-field theory, which agrees very well with the numerical results. This directly shows that the morphological transition on a one-dimensional lattice is completely different from that on high dimensions. Based on the mean-field analysis, we also conclude that the upper critical dimension for the roughening transition of the propagation of innovation is $d_u = 2$.