Asymmetrically coupled directed percolation systems

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We introduce a dynamical model of coupled directed percolation systems with two particle species. The two species $A$ and $B$ are coupled asymmetrically in that $A$ particles branch $B$ particles whereas $B$ particles prey on $A$ particles. This model may describe epidemic spreading controlled by reactive immunization agents. We study nonequilibrium phase transitions with focused attention to the multicritical point where both species undergo the absorbing phase transition simultaneously. In one dimension, we find that the inhibitory coupling from $B$ to $A$ is irrelevant and the model belongs to the unidirectionally coupled directed percolation class. On the contrary, a mean field analysis predicts that the inhibitory coupling is relevant and a new universality appears with a variable dynamic exponent. Numerical simulations on small-world networks confirm our predictions [1].