

LARGE DEVIATIONS OF THE FRONT IN A ONE-DIMENSIONAL $X + Y \rightarrow 2X$ REACTION

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RESUMEN. We investigate the probabilities of large deviations for the position of the front in a stochastic model of the reaction $X + Y \rightarrow 2X$ on the integer lattice in which Y particles do not move, while X particles move as independent simple continuous time random walks: upon contact with an X particle, a Y particle instantaneously becomes X . This model can be interpreted as an infection process, where X and Y particles represent ill and healthy individuals respectively, or as a combustion reaction, where the X and Y particles correspond to heat units and reactive molecules respectively, modeling the combustion of a propellant into a stable stationary state. For a wide class of initial conditions we prove that a large deviation principle holds for the position of the front, defined as the rightmost site visited by an X particle at a given time, showing that the zero set of the rate function is the interval $[0, v]$, where v is the velocity given by the law of large numbers. We also give more precise estimates for the rate of decay of the slowdown probabilities. Our results are in agreement with the phenomenon of slow (algebraic) relaxation of the velocity for pulled nonlinear diffusion equations studied in the physics literature, indicating a gapless property of the generator of the process. This is a joint work with Jean Bérard.

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