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Probing the depinning transition: contrasting lattice and continuum models YAN-JIUN CHEN, LASSP, Cornell University, STEFANO ZAPPERI, IENI-CNR, Milano,Italy, and ISI in Torino, Italy, JAMES P. SETHNA, LASSP, Cornell University — Models of depinning are used to study a wide variety of disordered systems where there are interfaces with jerky motion, including magnetic domain wall motion, fluid imbibition, and superconductor vortex lines. Analytic results from field theories are written in continuous time and space coordinates; but efficient algorithms are often done with cellular automata (CA). The equivalence of CA rules with the continuum models were justified by the appearance of a cusp in the disorder correlator after a finite-number of RG steps, especially for avalanche behavior that involve many degrees of freedom. However, in between this abrupt behavior, there exist slower dynamics where the avalanche almost stops, involving fewer degrees of freedom, and these regions may alter the scaling, as seen in recent studies of plastic deformation in crystals and crackling noise in glasses. Also, in our simulations, we find that discretization may introduce unwanted effects or relevant perturbations, such as a broken rotational symmetry. We compare and contrast results of the spatial and temporal structure of depinning from lattice and continuum simulations, and also provide complete functional forms to describe crossovers between different model classes.

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