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BKL Explorer: a tool to simulate the phenomenology of the BKL conjecture BEVERLY K. BERGER, National Science Foundation — Long ago, Belinskii, Khalatnikov, and Lifshitz (BKL) argued that the approach to the singularity in generic gravitational collapse behaved locally as a spatially homogeneous cosmology that was either velocity dominated (Kasner-like) or oscillatory (Mixmaster-like). This means that, operationally, in a numerical simulation of generic collapse, the PDE's of general relativity can be replaced at each spatial point by ODE's describing either the Kasner or Mixmaster cosmology. Numerical simulations of collapse in spatially inhomogeneous cosmologies support this argument. This suggests that, if one assumes this BKL conjecture to be true, one could explore the phenomenology of generic collapse by evolving, e.g., Mixmaster equations on a spatial grid with spatially dependent (smooth) initial conditions. The well known sensitivity to initial conditions would then be expected to yield an interesting, and potentially informative, visualization of the approach to the singularity. While this BKL regime is reached at different (BKL) time for different spatial points, it is likely that sufficiently close to the singularity, almost all (i.e., except at a set of measure zero) spatial points are in this regime. An algorithm originally developed by Garfinkle will be used to generate each local Mixmaster evolution. Results in one spatial dimension will be presented along with comparison to genuine spatially inhomogeneous simulations.

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