Abstract Submitted
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Trajectory Analysis for Inelastic Gravitational Billiards ANDY YOST, JEFFREY OLAFSEN, Department of Physics, Baylor University — We present an analysis for an experiment [1] involving the motion of a gravitational billiard undergoing inelastic collisions with a sloped boundary. The inelastic particle is set into ballistic motion within three types of boundary shapes: parabolic, hyperbolic, and wedge geometries. The two-dimensional experimental cell is oriented vertically with respect to gravity and motion is maintained by horizontal shaking. Trajectories for various boundary shapes, shaking frequencies, and amplitudes are analyzed to determine regions of periodic and chaotic behavior. The shaking is provided by a DC-motor and armature that allows for control of both the shaking amplitude and frequency. Comparison of the experimental results to numerical methods provides a sensitive test of the velocity dependence of the coefficient of restitution. The trajectories may also be examined to extract a Lyapunov exponent for the motion.

[1] S. Feldt and J. S. Olafsen, Phys. Rev. Lett. **94**, 224102 (2005).

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