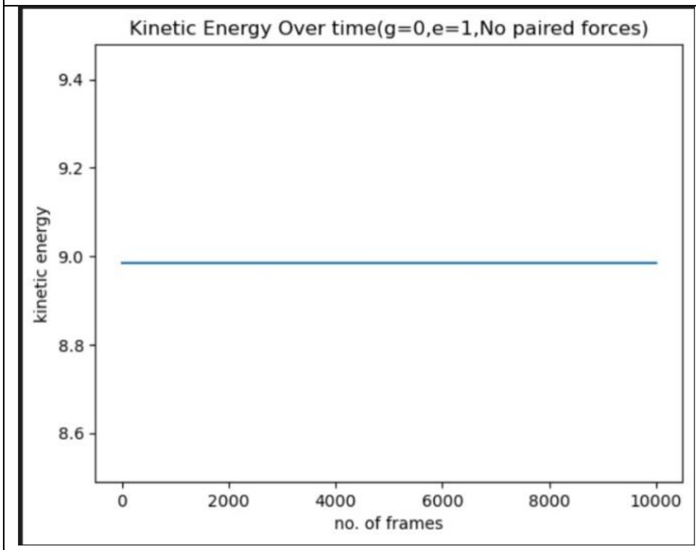
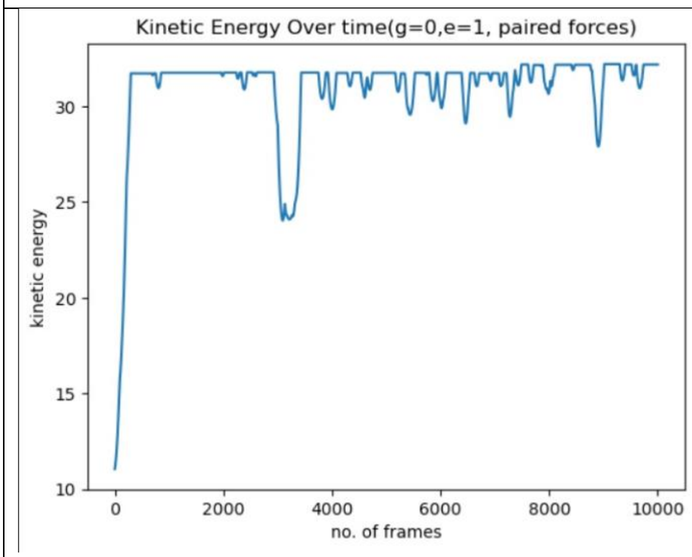
Kinetic Energy Analysis of Particle Simulations

PLOT	PARAMETERS (g, e, paired forces)	KINETIC ENERGY BEHAVIOR	EXPLANATION
	g=0 e=1 No Paired Forces	Perfectly Constant at 9.0.	This represents the ideal case for Energy and Momentum Conservation. With no gravity (g=0) and perfectly elastic collisions (e=1), Kinetic Energy (K) must be conserved. The flat line confirms the energy is neither gained nor lost.
	g=0 e=1 Paired Forces	Constant at approx 32 with sharp, momentary dips.	The e=1 and g=0 should conserve K. The fluctuations are due to the paired forces (likely repulsive/contact forces) causing temporary energy storage. Kinetic Energy (K) is converted to Elastic Potential Energy (Ue) during compression and immediately back to K upon expansion.

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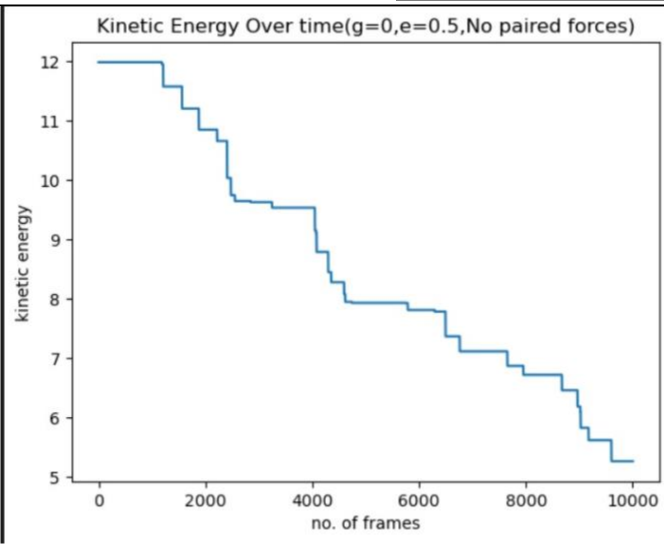
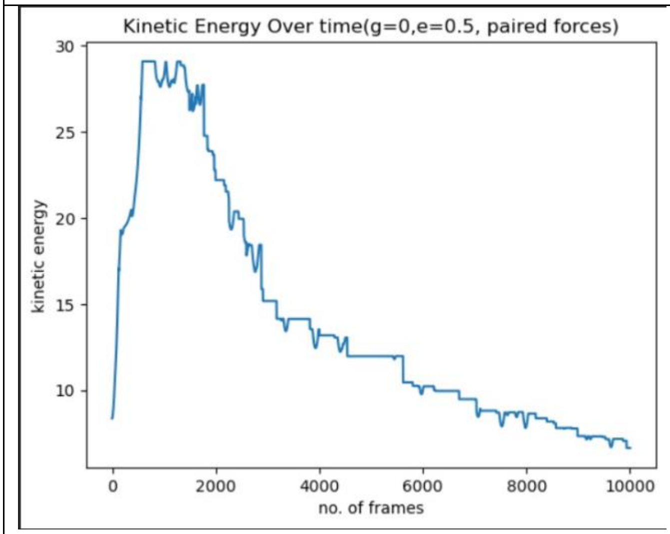
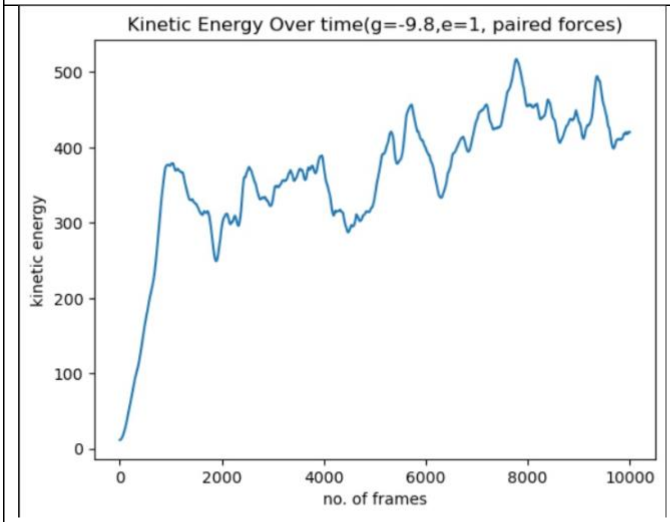
	g=0 e=0.5 No Paired Forces	Steady, stepwise decay from approx 12 to approx 5.5.	Inelastic collisions (e<1) cause a continuous loss of energy, dissipated as heat/sound. The stepwise appearance is characteristic of Discrete Event Systems where energy is lost only at the exact moments of collision.
	g=0 e=0.5 Paired Forces	Initial spike, then smooth, continuous decay from approx 28 to approx 7.	Inelastic collisions dissipate energy. The use of paired forces makes the interaction model more continuous and stable, resulting in a smoother energy decay curve compared to the stepwise loss when using no paired forces.
	g= -9.8 e=1 Paired Forces	Overall Increasing Trend with large, continuous fluctuations (peaks near 500).	Total Mechanical Energy (E = K + Ug) is conserved (since e=1 and gravity is conservative). The observed net increase in K suggests the system's Gravitational Potential Energy (Ug) is decreasing over time continuously

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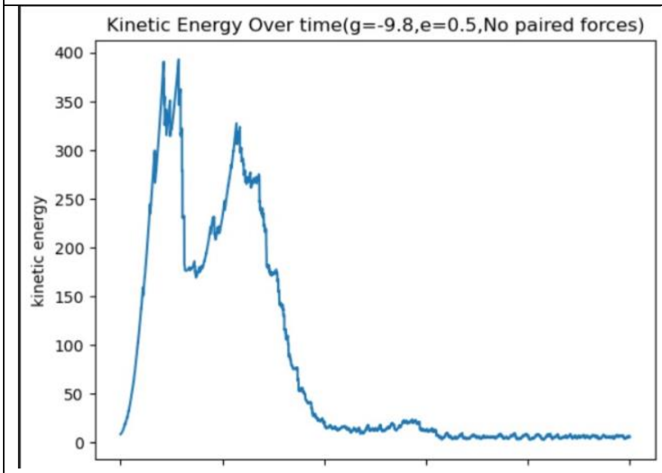
			converting Ug into K. The large fluctuations are the rapid exchange between K and Ug. The trend hasn't leveled off because the particles haven't reached a final, stable, low-energy configuration.
	g= -9.8 e=0.5 No Paired Forces	Sharp initial peak, then a rapid decay to near zero after approx 8000 frames.	Energy dissipation dominates. The energy loss from highly inelastic collisions (e=0.5) quickly overcomes any energy gain from gravity. The system reaches a Low-Energy State (likely particles settled at the bottom) where motion has nearly ceased.