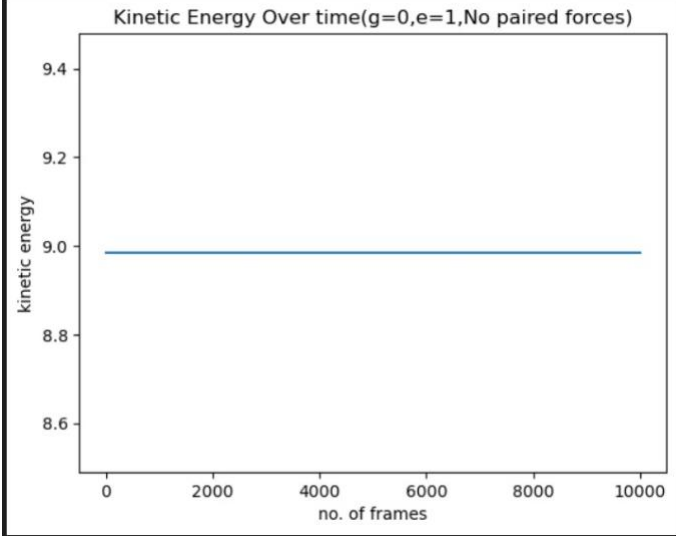
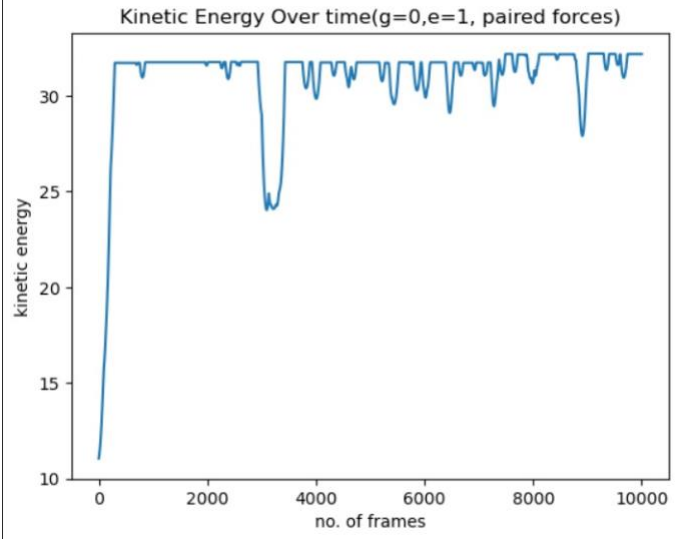
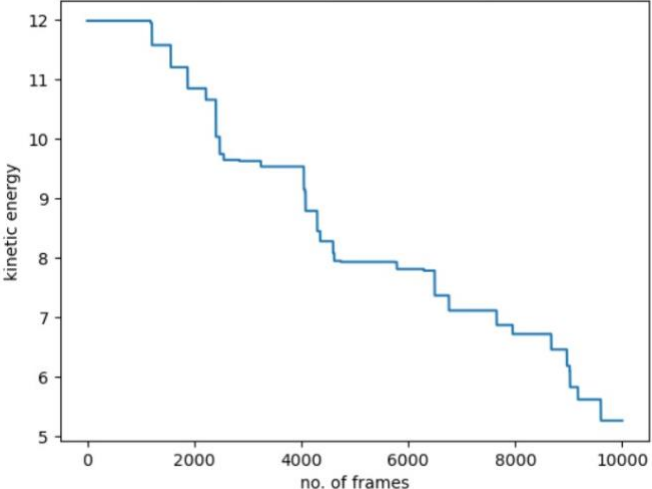
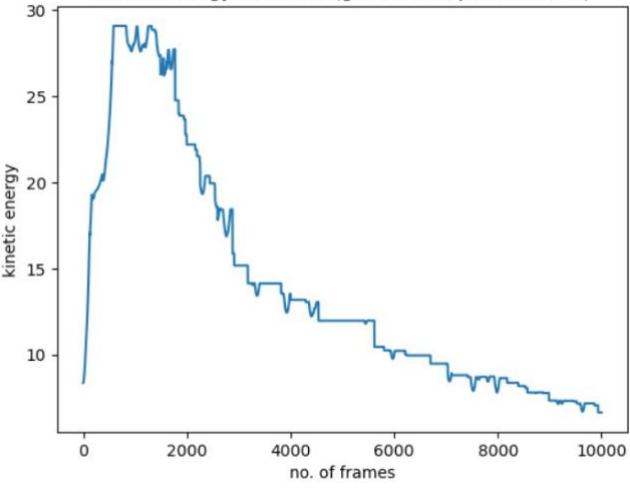
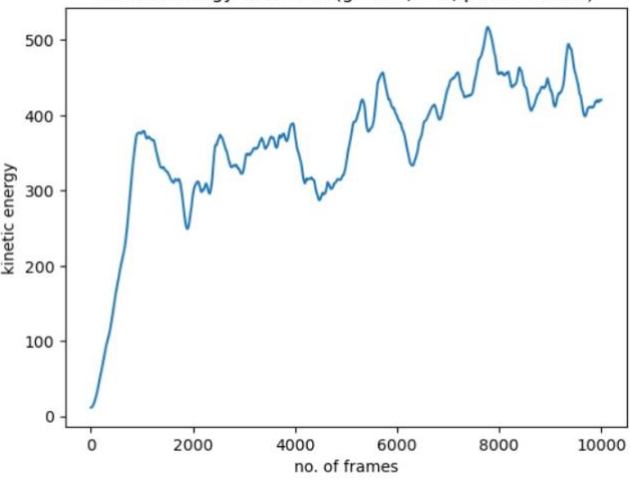


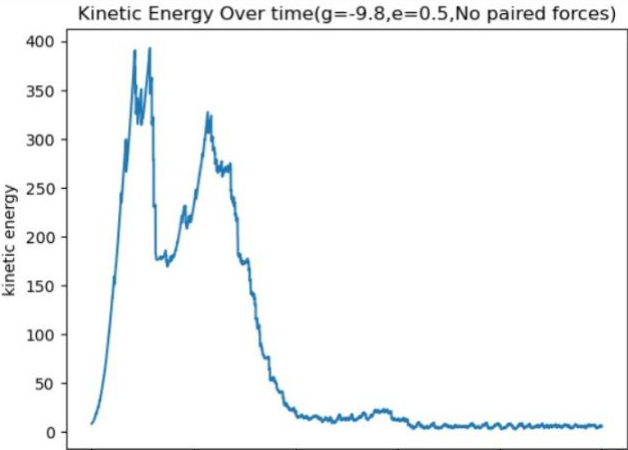
# Kinetic Energy Analysis of Particle Simulations

PLOT	PARAMETERS (g, e, paired forces)	KINETIC ENERGY BEHAVIOR	EXPLANATION
 <p>Kinetic Energy Over time(g=0,e=1,No paired forces)</p> <p>The plot shows kinetic energy on the y-axis (ranging from 8.6 to 9.4) versus the number of frames on the x-axis (ranging from 0 to 10,000). A single horizontal blue line is drawn at a kinetic energy value of 9.0, indicating that the energy remains constant throughout the simulation.</p>	<p>g=0 e=1 No Paired Forces</p>	<p>Perfectly Constant at 9.0.</p>	<p>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.</p>
 <p>Kinetic Energy Over time(g=0,e=1, paired forces)</p> <p>The plot shows kinetic energy on the y-axis (ranging from 10 to 30) versus the number of frames on the x-axis (ranging from 0 to 10,000). The blue line starts at approximately 11, rises sharply to about 32 by frame 500, and then remains relatively constant with significant high-frequency fluctuations. There is a notable sharp dip to approximately 24 around frame 3,000 before returning to the fluctuating level around 32.</p>	<p>g=0 e=1 Paired Forces</p>	<p>Constant at approx 32 with sharp, momentary dips.</p>	<p>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.</p>

# Kinetic Energy Analysis of Particle Simulations

<p>Kinetic Energy Over time(<math>g=0, e=0.5</math>, No paired forces)</p>  <p>The graph shows kinetic energy on the y-axis (ranging from 5 to 12) against the number of frames on the x-axis (ranging from 0 to 10,000). The energy starts at 12 and decreases in a series of discrete steps, reaching approximately 5.5 by frame 10,000.</p>	<p><math>g=0</math> <math>e=0.5</math> No Paired Forces</p>	<p>Steady, stepwise decay from approx 12 to approx 5.5.</p>	<p>Inelastic collisions (<math>e &lt; 1</math>) 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.</p>
<p>Kinetic Energy Over time(<math>g=0, e=0.5</math>, paired forces)</p>  <p>The graph shows kinetic energy on the y-axis (ranging from 10 to 30) against the number of frames on the x-axis (ranging from 0 to 10,000). The energy starts at approximately 8, rises sharply to a peak of nearly 30 around frame 1,000, and then decays smoothly and continuously to approximately 7 by frame 10,000.</p>	<p><math>g=0</math> <math>e=0.5</math> Paired Forces</p>	<p>Initial spike, then smooth, continuous decay from approx 28 to approx 7.</p>	<p>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.</p>
<p>Kinetic Energy Over time(<math>g=-9.8, e=1</math>, paired forces)</p>  <p>The graph shows kinetic energy on the y-axis (ranging from 0 to 500) against the number of frames on the x-axis (ranging from 0 to 10,000). The energy starts near 0, rises to about 380 by frame 1,000, and then exhibits large, continuous fluctuations between 300 and 500 for the remainder of the simulation.</p>	<p><math>g = -9.8</math> <math>e=1</math> Paired Forces</p>	<p>Overall Increasing Trend with large, continuous fluctuations (peaks near 500).</p>	<p>Total Mechanical Energy (<math>E = K + U_g</math>) is conserved (since <math>e=1</math> and gravity is conservative). The observed net increase in <math>K</math> suggests the system's Gravitational Potential Energy (<math>U_g</math>) is decreasing over time continuously</p>

# Kinetic Energy Analysis of Particle Simulations

			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.