

Homework 2, Brownian Motion

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5.1: a, b

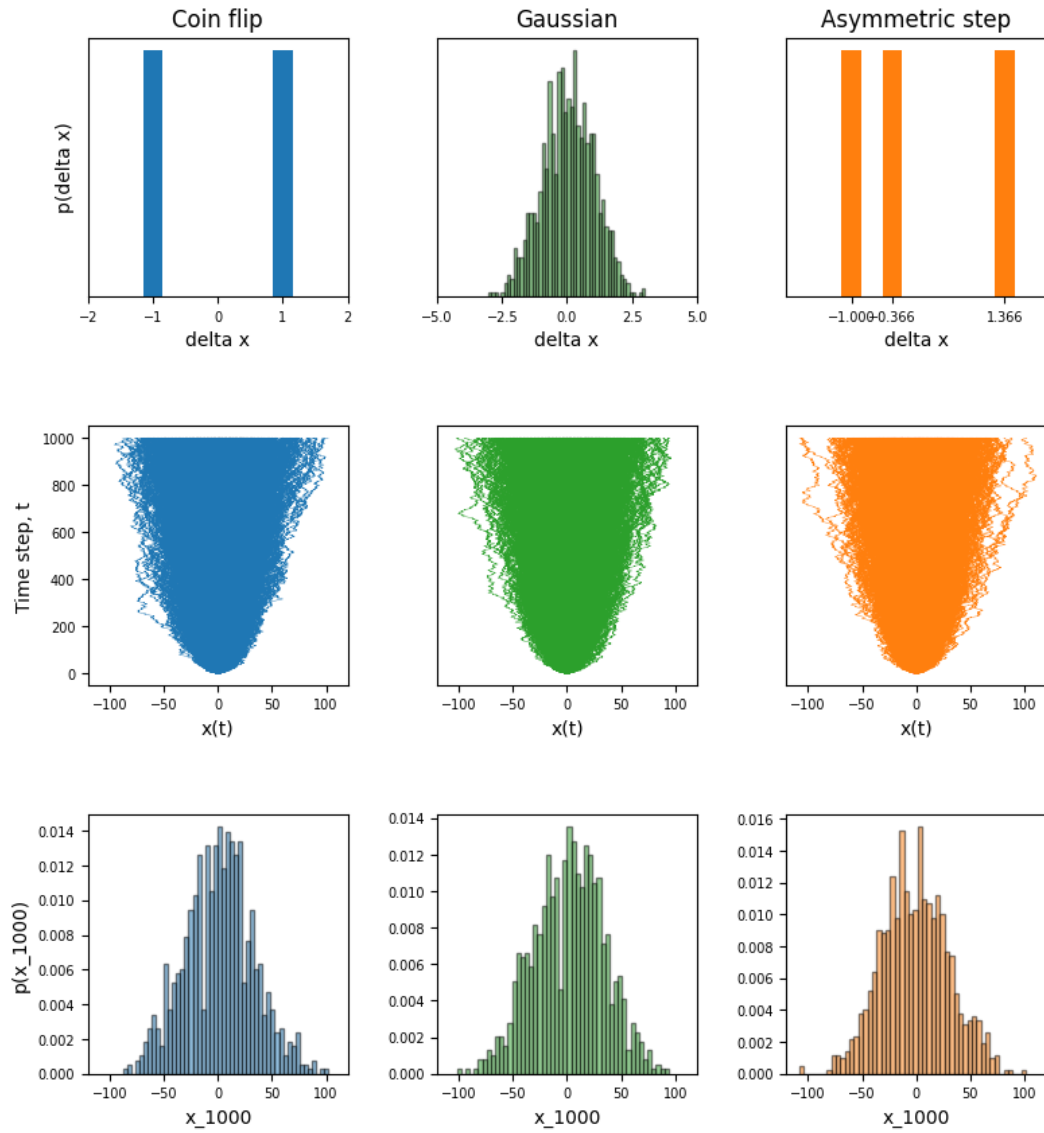


Figure 1: Sample trajectories of 1000 epochs and x_{1000} .

5.2: a, b

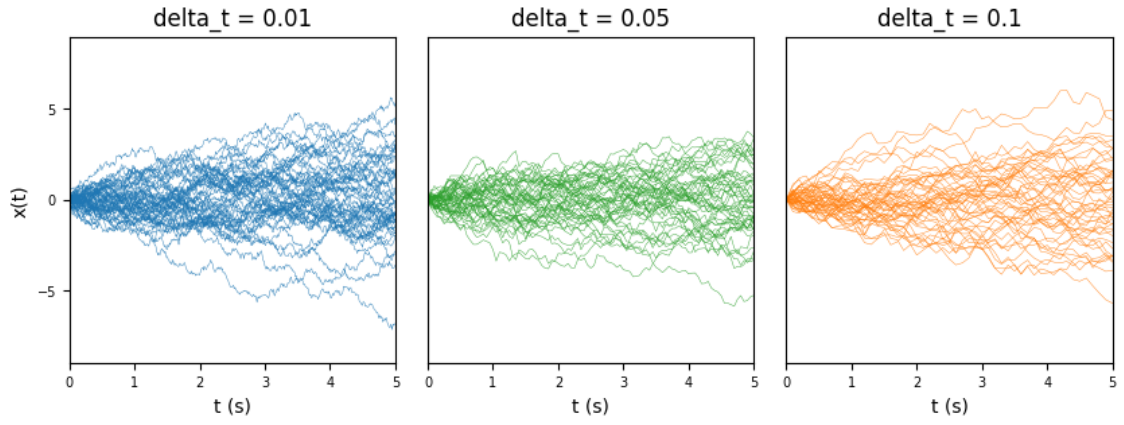


Figure 2: 50 five-second trajectories.

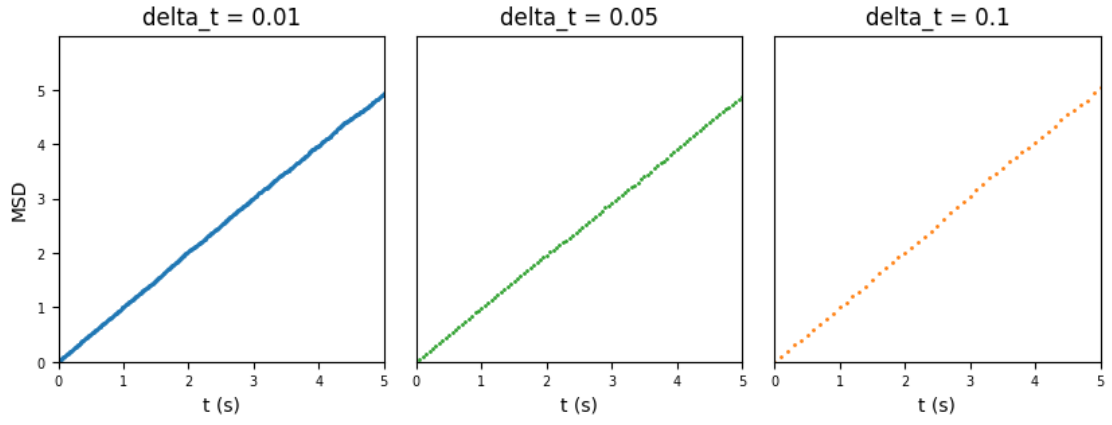


Figure 3: Ensemble averaged MSD for 10^4 trajectories.

5.3: a, b, c

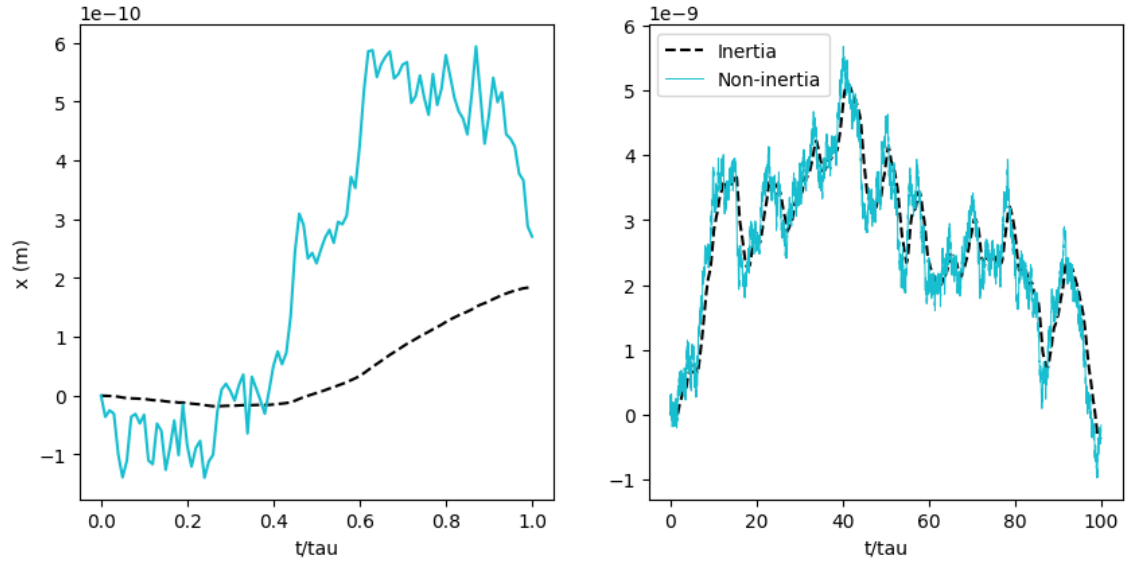


Figure 4: Simulation of Langevin equation with and without inertia (mass) for $\tau = 1$ and $\tau = 100$.

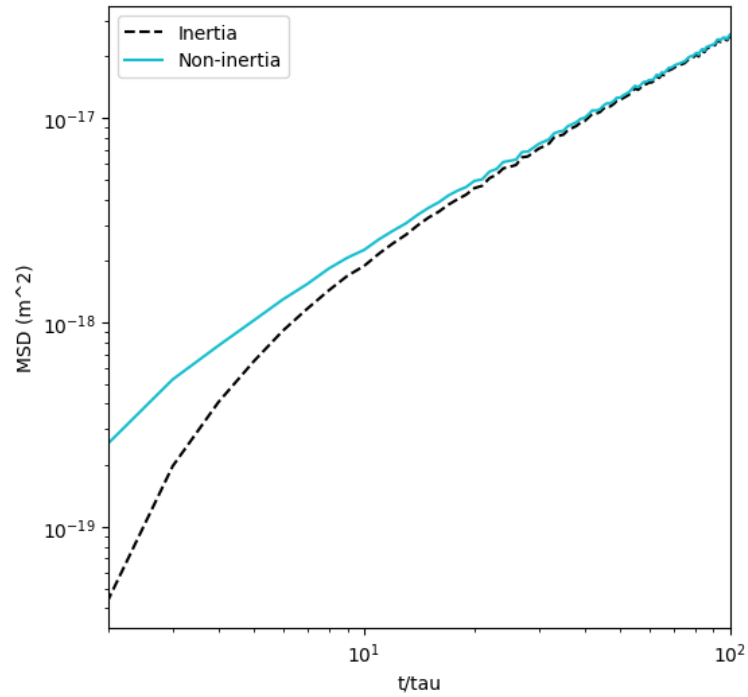


Figure 5: MSD with and without inertia for different τ -trajectories. Convergence around 20τ .

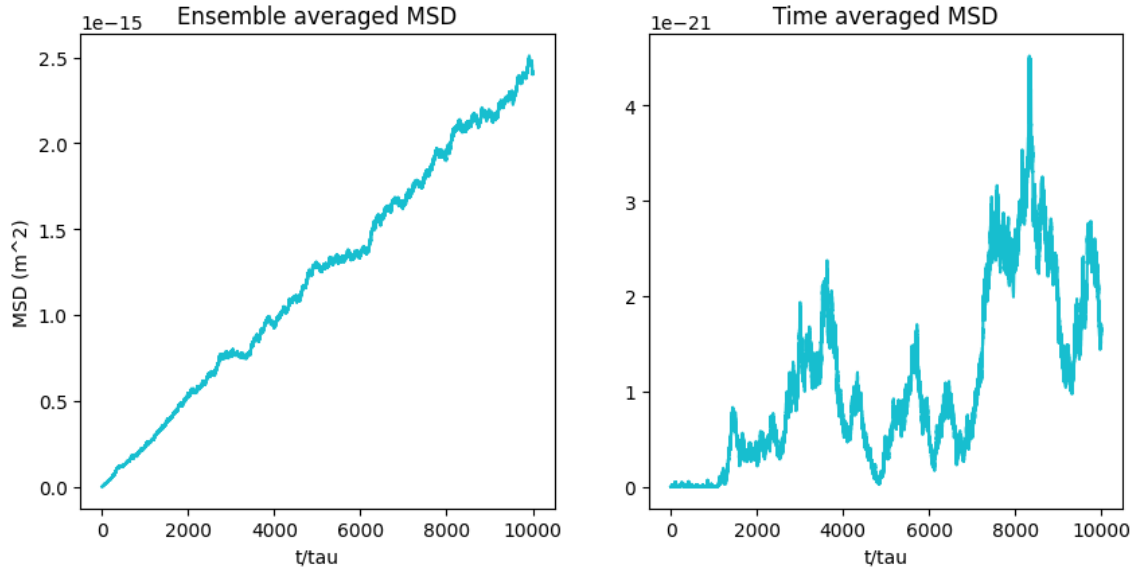


Figure 6: Ensemble MSD and time-averaged MSD over a long trajectory.

5.4: a, b, c

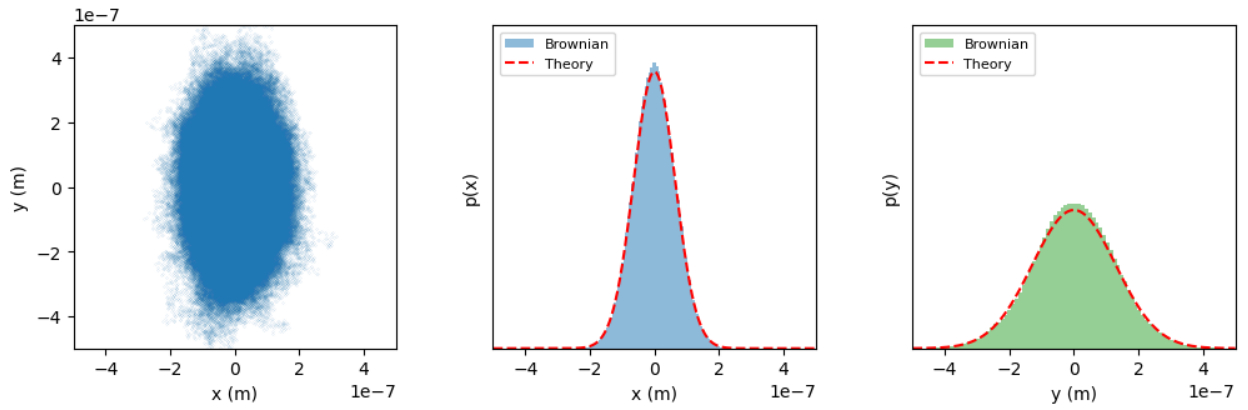


Figure 7: Simulation of brownian motion in 2D. Probability distribution for x and y and also the theory of the Boltzmann distribution for x and y.

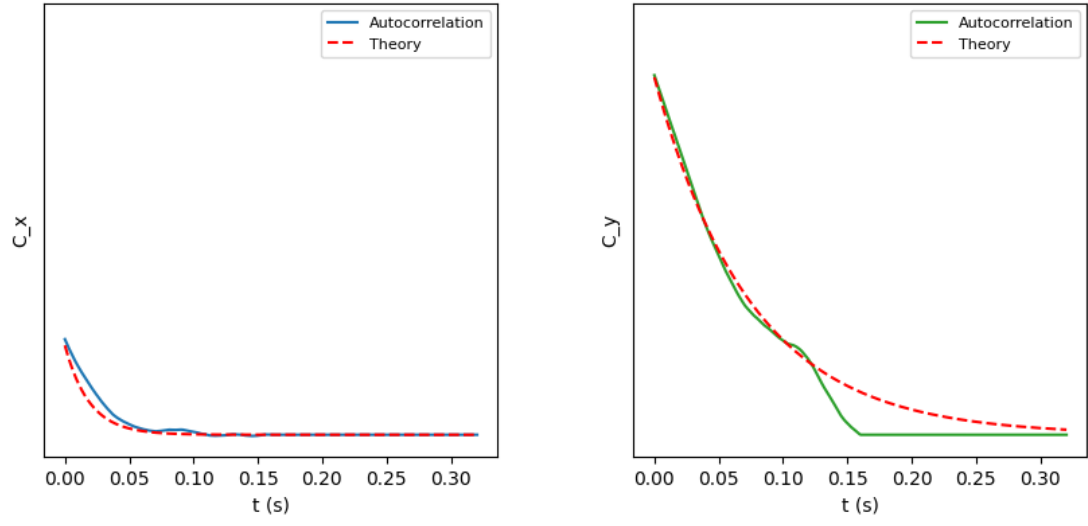


Figure 8: Positional autocorrelations $C_x(t)$ and $C_y(t)$.