Monte Carlo Simulation

The given ODE's were solved using Range Kutta 4^{th} order method using the given initial conditions $x(0) = y(0) = z(0) = 1$ in MATLAB (file name rk4.m). The plot of solution w.r.t time till 3 seconds is given below.

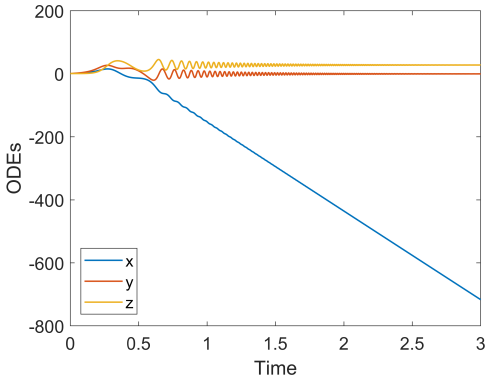
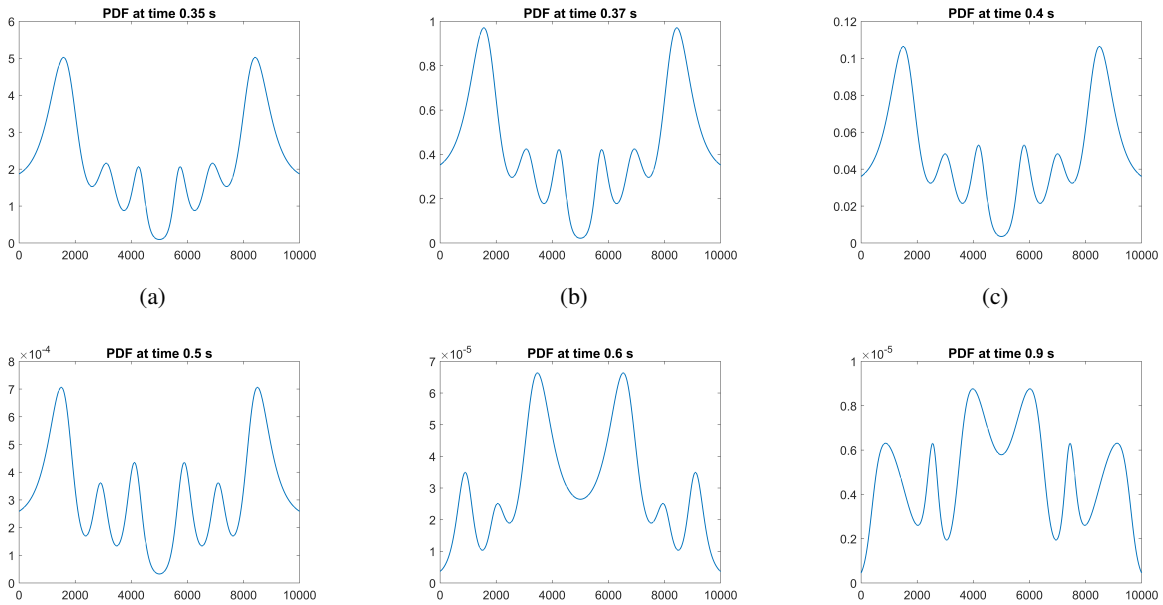


Figure 1: ODE Solution

10,000 elements were sampled from the joint Gaussian of data x,y,z (generated in MATLAB file name rk4Gauss.m) with mean $(1,1,1)$ and covariance of Identity matrix. The sampled elements were gives as initial conditions to solve the ODE's through RK4 scheme.Then for the obtained result joint PDF was done for obtained (x,y,z) for a few timesteps.The PDF plots are given below.



(a) (b) (c)

(d) (e) (f)

Figure 2: PDF plots.

It was observed that till 0.369 seconds probability is greater than 1,for example Figure 2(a) which means the data is unsuitable for PDF. after 0.369 seconds we have probability less than 1, figure 2(b) to (f). It can be seen that data is distributed at multiple mean with identical approximate variance. It can observed that, as the time step increases the probability decreases ,which means that data is highly deviated (least probable). Final inference is that the selected sample is not suitable for a good Monte Carlo Simulation.