Statistics 322, Statistical Computing, Home Work 5

Posted: Sept. 24, 1993 Due: Oct. 3, 1993

This is an exploration of random walks, and graphics. Write a MATLAB script file which generates the following:

1. Plots of 4 paths of the simple 1-dimensional random walk, for $n = 1, \ldots, 100$:

   a. The first plot should be of the "diagonal type" using different line types, and a "legend" which assigns a path number to each line (use the command `help legend` to see how to add this).

   b. The second plot should be of the "stair type" (you may wish to use the command `stairs` to do this). Don't put a legend on this one, and use all solid lines.

   notes: Turn in a single page print (you decide how to arrange the two plots on a page). Add appropriate titles to both (they should include your name). Bonus points will be awarded for especially attractive plots.

2. Plots of a single path of 2-dimensional random walks, for $n = 1, \ldots, 10000$, as follows:

   a. X_i, Y_i Bernoulli, with a plot of the path in 2 dimensions. Note that the process "loops over itself" quite a lot, and it is not clear how it evolves in time.

   b. To get a better impression for how the process evolves in time, plot the same path in 3-dimensions, using `plot3`, with the index n on the z axis. Carefully choose (by trial and error using `view`) the direction of the 3-d viewpoint, to maximize the "visual time information". Be creative about other ways to show time information on this plot.

   c. X_i, Y_i Gaussian, with a plot in 2 dimensions. Both (a) and (c) are close to "Brownian Motion", think about how they are similar to each other.

   d. X_i, Y_i Cauchy, with a plot in 2 dimensions. Think about how this path is much different from (a) and (b) (there is no Brownian limit here).

   e,f. Note that the Cauchy does not appear to contain 10,000 steps. This is because there a few "really big steps", which make other steps disappear. Show some of these other steps with two "zooms" that you choose. Show where the zooms came from with a "box" on the bigger plot. (zooms of zooms are interesting)

   notes: Again you decide how to array these plots on a single page, and add appropriate titles. Bonus points will be awarded for creativity in part (b).