Homework 1

Ma623 Stochastic Processes

due Tuesday Feb 2 2010

Please solve the problems 7.1-7.5 from the notes on the website (also handed in class). Then solve problems 7.6-7.10

(1) Write the probability space $(\Omega, \mathscr{F}, \mathbf{P})$ for a random experiment which records the result of n independent rolls of a balanced six-sided die (including the order). Define a random variable $D(\omega)$ which counts the number of different sides of the die recorded during these n rolls. Calculate the expected value of D.

(2) **(Simulation problem)** Using your choice of computer program learn how to simulate a toss of a fair coin (1 with prob 0.5 and 0 with probability 0.5). Then:

   (a) At step i simulate a sequence of $2^{20} = 1,048,576$ tosses and let L_i be the length of the largest sequence of ones among these tosses.

   (b) Repeat the previous for $i \in \{1, 2, \ldots, 1000\}$ (1000 times) each time recording the corresponding L_i

   Make a histogram of the values obtained. Calculate the average of the values. According to exercises 7.6-7.10 what values should be close to this average? Does this happen in your little experiment?

Any exercises assigned in class are bonus and will count as extra points toward the final grade.