Chapter 12

Random Walk Problem

1. Types of Distribution function

An event A occurs in n independent trial .In each Trial the event A has same probability $P(A)=p$,Then in a trial , A will not occur has probability $q=1-p$ .In n trials the random variable that that interested us is X =Number of times the event A occur in n trials

$$(X=0,1,2,3.....n)$$

Then probability of getting $X=x$ ($P(X=x)$ Means that A occurs in x trial and $n-x$ trials it does not occur then $P(X=x)={}^nC_x p^x q^{n-x}$ where $x=0,1,2,3.....n$

The mean value of x , $\langle X\rangle = np$ and variance $\sigma^2=npq$

Gaussian Distribution

The normal or Gauss distribution is defined as the distribution with density

$$f(x)=\frac{1}{\sqrt{2\pi\sigma^2}}\exp\left[-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right] \qquad -\infty < x < \infty$$

Where μ is mean value of x and σ^2 is variance of x

Center limit theorem

For large value of n the discrete binomial distribution can be approximated by Gauss distribution $f(x)$ with $\mu = np$ and variance $\sigma^2 = npq$

$$P(X = x) = {}^nC_x p^x q^{n-x} = f(x) = \frac{1}{\sqrt{2\pi(npq)}} \exp\left[-\frac{1}{2}\left(\frac{x-np}{\sqrt{npq}}\right)^2\right] \quad -\infty < x < \infty$$