###eg1

n=100

p=0.5

gam=rbinom(n,1,p)

X=gam\*rnorm(n,mean=7,sd=0.5)+(1-gam)\*rnorm(n,mean=10,sd=0.5)

hist(X, prob=TRUE, col="grey")

lines(density(X), col="blue", lwd=2)

target<-function(theta)

{

a=(exp(theta)/(1+exp(theta)))\*dnorm((X-7)/0.5,0,1)+

(1/(1+exp(theta)))\*dnorm((X-10)/0.5,0,1)

return(prod(a)\*exp(theta)\*(1+exp(theta))^(-2))

}

alpha<-function(theold,thenew)

{

return(target(thenew)/target(theold))

}

theta=NULL

theta[1]=rnorm(1,0,1)

sigma=0.37

T=100000

acc=NULL

for(t in 1:T)

{

theold=theta[t]

thenew=rnorm(1,mean=theta[t],sd=sigma)

u=runif(1,0,1)

acc[t]=I(u<=min(1,alpha(theold,thenew)))

theta[t+1]=thenew\*I(u<=min(1,alpha(theold,thenew)))

+theold\*I(u>min(1,alpha(theold,thenew)))

}

plot(theta[1:T])

mean(acc)

## monitor convergence by gelman factor

Q=5

T=1000

sigma=0.37

theta=matrix(nrow=T+1,ncol=Q)

for(q in 1:Q)

{

theta[1,q]=rnorm(1,0,1)

for(t in 1:T)

{

theold=theta[t,q]

thenew=rnorm(1,mean=theta[t,q],sd=sigma)

u=runif(1,0,1)

acc=I(u<=min(1,alpha(theold,thenew)))

theta[t+1,q]=thenew\*I(u<=min(1,alpha(theold,thenew)))

+theold\*I(u>min(1,alpha(theold,thenew)))

}

}

require(coda)

require(rjags)

object <- list(NA)

object[[1]]=mcmc(theta[,1])

object[[2]]=mcmc(theta[,2])

object[[3]]=mcmc(theta[,3])

object[[4]]=mcmc(theta[,4])

object[[5]]=mcmc(theta[,5])

obj <- mcmc.list(object)

gelman.diag(obj)

gelman.plot(obj)

##eg2

n=100

prob=c(0.2,0.3,0.5)

require(stats)

Y=rmultinom(1, n, prob)

p1=NULL

p2=NULL

a1=1

a2=1

a3=1

p1[1]=runif(1,0,0.3)

p2[1]=runif(1,0,0.3)

T=10000

for(t in 1:T)

{

p1[t+1]=(1-p2[t])\*rbeta(1,a1+Y[1],a3+Y[3])

p2[t+1]=(1-p1[t+1])\*rbeta(1,a2+Y[2],a3+Y[3])

}

plot(p1)

plot(p2)

## how to use the results?

## 1. parameter estimation

## 2. credible interval

## 3. hypothesis testing

## eg 3. classification

set.seed(1000)

n=100

p=0.5

gam=rbinom(n,1,p)

X=gam\*rnorm(n,mean=7,sd=0.5)+(1-gam)\*rnorm(n,mean=10,sd=0.5)

hist(X, prob=TRUE, col="grey")

lines(density(X), col="blue", lwd=2)

T=10

gammat=matrix(nrow=T+1,ncol=n)

p=NULL

gammat[1,]=rbinom(n,1,0.5)

p[1]=runif(1,0,1)

for(t in 1:T)

{

for(i in 1:n)

{

tmpp=p[t]\*dnorm((X[i]-7)/0.5,0,1)/(p[t]\*dnorm((X[i]-7)/0.5,0,1)+(1-p[t])\*

dnorm((X[i]-10)/0.5,0,1))

gammat[t+1,i]=rbinom(1,1,tmpp)

}

p[t+1]=rbeta(1,1+sum(gammat[t+1,]),n+1-sum(gammat[t+1,]))

}

par(mfrow=c(3,2))

plot(gammat[,1])

plot(gammat[,5])

plot(gammat[,20])

plot(gammat[,50])

plot(gammat[,80])

plot(gammat[,100])

gam[1]

gam[5]

gam[20]

gam[50]

gam[80]

gam[100]

plot(p)