close all;

clc;

clear all;

p0=0.3;p1=0.7;s=[];X=[];S=[];

n1=0;

n2=0;

for i=1:1000

k=rand(1);

if k>p0

S(i)=1;

n1=n1+1;

else

S(i)=0;

n2=n2+1;

end

end

S;

length(S);

for q=1:1000;

if (S(q)==1)

X((100\*(q-1)+1):100\*q)=5\*ones(1,100);

else

X((100\*(q-1)+1):100\*q)=(-4)\*ones(1,100);

end

end

N=sqrt(10)\*randn(1,100000);

Y=X+N;

for i=-4:0.01:5

if( ( erfc ( (i+4)/sqrt(20) ) + erfc( (i-5)/sqrt(20) )) == 2)

th=i;

end

end

dtt1=zeros(1,1000);

for i=1:1000

Z=Y((100\*(i-1))+1);

if (Z-th>=0)

dtt1(i)=1;

end

end

dtt1;

b1=0;

for i=1:1000

if (S(i)-dtt1(i)==0)

b1=b1+1;

end

end

b1=(b1\*100)/1000;

m1=sprintf('mini max technique with detection rate (percentage) = %d',b1);

%m2=sprintf('Difference between detected and transmitted signal with threshold=0 with detection rate =%d',d2);

subplot(4,1,1);stem(X);title('Transmitted signal');xlabel('n(seconds)');ylabel('X[n]');

subplot(4,1,2);stem(Y);title('Received signal (AGN model)');xlabel('n(seconds)');ylabel('Y[n]');

%subplot(6,1,5);stem(diff1);title(m1);xlabel('n(seconds)');ylabel('diff1[n]');

%subplot(6,1,6);stem(diff2);title(m2);xlabel('n(seconds)');ylabel('diff2[n]');

subplot(4,1,3);stem(S);title('transmitted sequence ');xlabel('n(seconds)');ylabel('detect1[n]');

subplot(4,1,4);stem(dtt1);title(m1);xlabel('n(seconds)');ylabel('detect[n]');

%5th

B2=[];

th1=[];

yy=1;

for p0=0.1:0.1:0.9

th1=0.5+(10/9)\*log( ( p0 / (1-p0) ) );

dtt2=zeros(1,1000);

for i=1:1000

Z=Y((100\*(i-1))+1);

if (Z-th1>=0)

dtt2(i)=1;

end

end

b2=0;

for i=1:1000

if (S(i)-dtt2(i)==0)

b2=b2+1;

end

end

B2(yy)=b2;

yy=yy+1;

end

B2=[0 B2 0]

figure

vv=0:0.1:1;

stem(vv,B2);

xlabel( 'pi0'); ylabel('detection rate')

title('detection rate corresponding to 10000 samples with varring probability of pi0');

j1=0;j2=0;

dtt2=zeros(1,1000);

th1=0;

for i=1:1000

Z=Y((100\*(i-1))+1);

if (Z-th1>=0)

dtt2(i)=1;

end

end

dtt2;

b2=0;

for i=1:1000

if (S(i)-dtt2(i)==0)

b2=b2+1;

end

end

for i=1:1000

if(S(i)==1)

j1=j1+1;

if(dtt2(i)==0)

j2=j2+1;

end

end

end

j3=0;j4=0;

for i=1:1000

if(S(i)==0)

j3=j3+1;

if(dtt2(i)==1)

j4=j4+1;

end

end

end

p10=j2/j1

p01=j4/j3

lam1=p01;

lam0=p10;

i=1;

for k=0:0.1:1

c1(i) = k\*lam1 + (1-k)\*lam0;

c2(i) = k\*(1-lam1) + (1-k)\*(1-lam0);

c3(i) = k;

c4(i) = 1-k;

i=i+1;

end

figure

K=0:0.1:1;

plot(K,c1,'r');hold on;

plot(K,c2,'k');hold on;

plot(K,c3,'b');hold on;

plot(K,c4,'g');hold on;

r01 = (min(c4) - max(c4))/(min(c1) - max(c1) - max(c4) + min(c4) )

Y1=[];

ro=(0-1)/(0.053-0.103-1+0)

for i=1:1000

gg=rand(1);

if(gg<r01)

if (dtt2(i)==1)

Y1(i)=1;

else

Y1(i)=0;

end

else

Y1(i)=0;

end

end

b3=0;

for i=1:1000

if ( S(i)-Y1(i)==0 )

b3=b3+1;

end

end

b3;

figure

m2=sprintf('mini max technique binary channel model with detection rate = %d',(b3/100));

subplot(4,1,1);stem(X);title('Transmitted signal');xlabel('n(seconds)');ylabel('X[n]');

subplot(4,1,2);stem(Y);title('Received signal (AGN model)');xlabel('n(seconds)');ylabel('Y[n]');

subplot(4,1,3);stem(S);title('transmitted sequence ');xlabel('n(seconds)');ylabel('magnitude');

subplot(4,1,4);stem(Y1);title(m2);xlabel('n(seconds)');ylabel('magnitude');