Simulate the operations performed in the regeneration circuit of the PCM system receiver, include input, ampliﬁer equalizer, timing circuit, decision making device, and output. You should add appropriate noise in distorted signal, and calculate the bit error rate at the end of receiver.

**PROGRAM**

clc;

clear all;

close all;

L = 4;

dV = 4.5;

aG = 4;

nC= 0.4;

bitLength = 8;

%Pulse train

function [a,b] = pT(Freq,x,r)

div = floor(Freq/x);

b = zeros(1,r);

a = 0;

TP = zeros(1,r);

for i = 1: r

if(rem(i,div)==0)

b(1,i)=1;

a = a+1;

end

end

endfunction

%Bit Matrix

function Bit = bMat(r,b,Th,Data,Cnt)

cT = 0;

Bit = zeros(1,Cnt);

i = 1;

while(i<=r)

if(b(1,i)==1)

cT = cT+1;

if(Data(i,1)>Th)

Bit(1,cT)=1;

else Bit(1,cT)=0;

end

end

i = i+1;

end

endfunction

%Distorted input signal with noise

ipSig = L\*pi\*linspace(0,1,1024)';

[rx cx] = size(ipSig);

dipSig = sin(pi\*ipSig)+cos(3\*pi\*ipSig)+sin(4\*pi\*ipSig)+cos(pi\*ipSig)+sin(5\*pi\*ipSig);

y = abs(dipSig);

for i = 1:rx

if(y(i,1)<1)

y(i,1)=0;

end

end

mySig = y+nC\*randn(length(dipSig),1);

subplot(5,1,1);plot(ipSig,mySig);

title("Distorted Signal");

ylabel('Amplitude');xlabel('Time');

line([0 L\*pi],[0 0],"linestyle",":","color","r");

axis([0,L\*pi,-1,4]);

%Equalizer

eS = zeros(rx,1);

for i = 1:rx

if(mySig(i,1)<0)

eS(i,1)=mySig(i,1)\*-1;

mySig(i,1)=mySig(i,1)+eS(i,1);

end

end

subplot(5,1,2); plot(ipSig,eS);

title("Equalising Signal");

ylabel('Amplitude');xlabel('Time');axis([0,L\*pi, -1,4]);

%Amplifier

mySig = aG\*mySig;

subplot(5,1,3);plot(ipSig,mySig);

strplot=sprintf("Amplified signal with Decison level %d",dV);

title(strplot);

ylabel('Amplitude');xlabel('Time');

line([0 L\*pi],[dV,dV],"linestyle",":","color","g");

axis([0, L\*pi,-1, 4\*aG]);

%Actual bit values

[sig\_bitCt,sig\_tp]=pT(64,L,rx);

sigBit = bMat(rx,sig\_tp,0,y,sig\_bitCt)

%Timing Circuit

[d\_bitCt,d\_tp]=pT(64,L,rx);

subplot(5,1,4);stem(ipSig,d\_tp);

title("Timing Signal");

ylabel('Amplitude');xlabel('Time');

axis([0,L\*pi,0,1]);

%Decision making

printf("Decision level: %d\n",dV);

outD = bMat(rx,d\_tp,dV,mySig,d\_bitCt)

subplot(5,1,5);stairs(outD);

title("Regenerated signal");

ylabel('Amplitude');xlabel('Time');

axis([0,d\_bitCt,0,1.5]);

%Bit Error rate(BER)

E = 0;

n = d\_bitCt;

while(d\_bitCt>0)

if(outD(1,d\_bitCt)!=sigBit(1,d\_bitCt));

E = E+1;

end

d\_bitCt = d\_bitCt -1;

endwhile

printf("Number of transmitted bit: %d\n",n);

printf("Number of Error Bits: %d\n",E);

printf("Bit Error Rate(BER): %d\n",E/n);

**OUTPUT**



