function [Ls,S,Md,Jth\_T2,Jth\_SPE]=DCCA\_nomal(X,Y)

%求均值

Y\_mean=mean(Y,2);

X\_mean=mean(X,2);

%求标准差

Y\_std = std(Y,0,2);

X\_std = std(X,0,2);

%数据标准化

[mY,nY]=size(Y);

[mX,nX]=size(X);

Y=(Y - repmat(Y\_mean,1,nY))./repmat(Y\_std,1,nY);

X=(X - repmat(X\_mean,1,nX))./repmat(X\_std,1,nX);

Y=transpose(Y);

X=transpose(X);

% 构造Zp（过去信息）、Yf（未来输出）、Xf（未来输入）

for i= 2:nY-10

zp(1) = Y(i-1,:);

zp(2:mX+1) = X(i-1,:);

Zp(i-1,:) = zp;

yf(1) = Y(i,:);

yf(2) = Y(i+1,:);

yf(3) = Y(i+2,:);

yf(4) = Y(i+3,:);

yf(5) = Y(i+4,:);

Yf(i-1,:) = yf;

xf(1:mX) = X(i,:);

xf(mX+1:2\*mX) = X(i+1,:);

xf(2\*mX+1:3\*mX) = X(i+2,:);

xf(3\*mX+1:4\*mX) = X(i+3,:);

xf(4\*mX+1:5\*mX) = X(i+4,:);

Xf(i-1,:) = xf;

end

Z(:,1:mX+mY) = Zp;

Z(:,mX+mY+1:6\*mX+mY) = Xf;

[mZ,nZ]=size(Z);

Z\_cov = Z' \* Z/(mZ-1);

Z\_Yf\_cov = Z' \* Yf/(mZ-1);

% Yf\_Z\_cov = Yf \* Z'/(mZ-1);

Yf\_cov = Yf' \* Yf/(mZ-1);

COV = (Z\_cov^-0.5)\*Z\_Yf\_cov\*(Yf\_cov^-0.5);

r\_rank = rank(COV);

[U,S,V] = svd(COV);

Js = (Z\_cov^-0.5) \* U(:,1:r\_rank);

Ls = (Yf\_cov^-0.5) \* V(:,1:r\_rank);

% Ms = Js\*S';

An = Ls\*Yf'\*Z\*Js;

Md = An\*Js' ;

%计算控制限

m=mZ;

n=nZ;

alpha=0.95;%置信水平

%求X的协方差矩阵的最大特征值

s=cov(Z);

Romita\_max=max(eig(s));

Jth\_T2=Romita\_max\*r\_rank\*(n^2-1)\*finv(alpha,r\_rank,n-r\_rank)/(n\*(n-r\_rank));

Jth\_SPE=Romita\_max\*chi2inv(alpha,r\_rank);