clc; Bulanık Mantık Ödev 1 - 1.si Kartezyen Çarpım

clear all;

x=[0,1,2,3,4,5];

muAx=[0,0,1,0.5,0,0];

a=10;b=11;c=12;d=13;e=14;f=15;

y=[a,b,c,d,e,f];

muBy=[0,0,0,0.5,1,1];

for ii=1:6

for jj=1:6

KARcrpm(ii,jj)=min(muAx(ii),muBy(jj));

end

end

for ii=1:6

for jj=1:6

fprintf('KARcrpm[%i,%i] => %i\n',ii,jj,KARcrpm(ii,jj));

end

fprintf('\n');

end

mesh(KARcrpm)

xlabel('y');

ylabel('x');

zlabel('Kartezyen Çarpım');

title('Kartezyen Çarpım Sonucu - 3 Boyutlu ÜF'); -son

clc; Bulanık Mantık Ödev 1 – 2.si Kartezyen Yardımcı Çarpım

clear all;

x=[0,1,2,3,4,5];

muAx=[0,0,1,0.5,0,0];

a=10;b=11;c=12;d=13;e=14;f=15;

y=[a,b,c,d,e,f];

muBy=[0,0,0,0.5,1,1];

for ii=1:6

for jj=1:6

KARycrpm(ii,jj)=max(muAx(ii),muBy(jj));

end

end

for ii=1:6

for jj=1:6

fprintf('KARycrpm[%i,%i] => %i\n',ii,jj,KARycrpm(ii,jj));

end

fprintf('\n');

end

mesh(KARycrpm)

xlabel('y');

ylabel('x');

zlabel('Kartezyen Yardımcı Çarpım');

title('Kartezyen Yardımcı Çarpım Sonucu - 3 Boyutlu ÜF'); - son

Bulanık Mantık Ödev 2 main (Ana) Fonksiyon

clc; Bulanık Mantık Ödev 2 main (Ana) Fonksiyon

clear all;

x = 0:0.1:10;

muAx = furkanmf(x,[3 7]);

%subplot(4,1,1);

figure(1);

plot(x,muAx);

xlabel('furkanmf, P = [3 7]');

ylabel('muAx');

ylim([-0.05 1.05]);

title('Z Biçimli Sigmoidal ÜF');

y = 0:0.1:10;

muBy = eyupmf(x,[2 4 6]);

%subplot(4,1,2);

figure(2);

plot(y,muBy);

xlabel('eyupmf, P=[2 4 6]');

ylabel('muBy');

ylim([-0.05 1.05]);

title('Çan (Genelleştirilmiş Gauss) ÜF');

[X,Y]=meshgrid(x,y);

for ii=1:length(x)

for jj=1:length(y)

Tnorm\_Cebirsel\_Carpim(ii,jj)=muAx(ii)\*muBy(jj);

end

end

for ii=1:length(x)

for jj=1:length(y)

Snorm\_Cebirsel\_Toplam(ii,jj)=muAx(ii)+muBy(jj)-muAx(ii)\*muBy(jj);

end

end

%subplot(4,2,1);

figure(3);

mesh(X,Y,Tnorm\_Cebirsel\_Carpim);

xlabel('X');

ylabel('Y');

zlabel('T-norm Cebirsel Çarpım');

title('Z Biçimli Sigmoidal ÜF ile Çan (Genelleştirilmiş Gauss) ÜF''nin T-norm Cebirsel Çarpımı');

%subplot(4,2,2);

figure(4);

mesh(X,Y,Snorm\_Cebirsel\_Toplam);

xlabel('X');

ylabel('Y');

zlabel('S-norm Cebirsel Toplam');

title('Z Biçimli Sigmoidal ÜF ile Çan (Genelleştirilmiş Gauss) ÜF''nin S-norm Cebirsel Toplamı');

eyupmf

function y = eyupmf(x, parametreler)

if nargin ~= 2

error('Genel argüman MF tarafından iki argüman gereklidir.');

elseif length(parametreler) < 3

error('Genelleştirilmiş çan MF en az üç parametreye ihtiyaç duyar.');

elseif parametreler(1) == 0,

error('Gbellmf de geçersiz parametre () --> a == 0');

end

a = parametreler(1); b = parametreler(2); c = parametreler(3);

tmp = ((x - c)/a).^2;

if (tmp == 0 & b == 0)

y = 0.5;

elseif (tmp == 0 & b < 0)

y = 0;

else

tmp = tmp.^b;

y = 1./(1 + tmp);

end

furkanmf

function y = furkanmf(x, parametreler)

if nargin ~= 2,

error('ZMF tarafından iki argüman gereklidir.');

elseif length(parametreler) < 2,

error('ZMF en az iki parametreye ihtiyaç duyar.');

end

x1 = parametreler(1); x0 = parametreler(2);

if x1 >= x0,

y = x <= (x0+x1)/2;

return;

end

y = zeros(size(x));

index1 = find(x <= x1);

if ~isempty(index1),

y(index1) = ones(size(index1));

end

index2 = find((x1 < x) & (x <= (x1+x0)/2));

if ~isempty(index2),

y(index2) = 1-2\*((x(index2)-x1)/(x1-x0)).^2;

end

index3 = find(((x1+x0)/2 < x) & (x <= x0));

if ~isempty(index3),

y(index3) = 2\*((x0-x(index3))/(x1-x0)).^2;

end

index4 = find(x0 <= x);

if ~isempty(index4),

y(index4) = zeros(size(index4));

end

Odev\_3\_Tnorm\_Cebirsel\_Carpim

clc;

clear all;

%%

x=-5:.1:5;

y=-1:.1:1;

z=0:.1:12;

[X,Y] = meshgrid(x,y);

%%

MuANN = zmf(x,[-5 -3]);

figure(1);

subplot(3,1,1);

plot(x,MuANN,'g');

%%

MuBN = trapmf(x,[-5 -3 -2 0]);

hold on,plot(x,MuBN,'b');

%%

MuCSFR = gaussmf(x,[-.6 0]);

plot(x,MuCSFR,'k');

%%

MuDP = trimf(x,[0.5 2.5 4.5]);

plot(x,MuDP,'r');

%%

MuEPP = smf(x,[3 5]);

plot(x,MuEPP,'');

xlim([-5.05 5.05]);

ylim([-0.05 1.05]);

legend('NN','N','SFR','P','PP');

xlabel('e');

ylabel('Mü(e)');

title('Mü e Üf - 1. Giriş Üf''sinin İlk Hali');

%%

hold off;

subplot(3,1,2);

MuAn = trapmf(y,[-1 -1 -0.4 0.4]);

plot(y,MuAn,'g');

%%

MuBs = gaussmf(y,[-0.2 0]);

hold on,plot(y,MuBs,'b');

%%

MuCp = trimf(y,[0 1 1]);

plot(y,MuCp,'r');

xlim([-1.05 1.05]);

ylim([-0.05 1.05]);

legend('n','s','p');

xlabel('Delta e');

ylabel('Mü(Delta e)');

title('Mü Delta e Üf - 2. Giriş Üf''si');

%%

hold off;

subplot(3,1,3);

MuACK = zmf(z,[1 2]);

plot(z,MuACK,'g');

%%

MuBK = trapmf(z,[1 2 3 4]);

hold on,plot(z,MuBK,'b');

%%

MuCO = trimf(z,[3 5 7]);

plot(z,MuCO,'k');

%%

MuDB = gaussmf(z,[0.85 6.5]);

plot(z,MuDB,'r');

%%

MuECB = smf(z,[7 9]);

plot(z,MuECB,'');

xlim([-0.05 12.05]);

ylim([-0.05 1.05]);

legend('CK','K','O','B','CB');

xlabel('u');

ylabel('Mü(u)');

title('Mü u - Çıkış Üf''sinin İlk Hali');

%%

[aa,bb]=size(X);

%%[cc,dd]=size(Y);

for ii=1:aa

for jj=1:bb%%cc,dd

%Aktiflik Dereceleri

w1=zmf(X(ii,jj),[-5 -3])\*trapmf(Y(ii,jj),[-1 -1 -0.4 0.4]);%MuANN,MuAn

w2=zmf(X(ii,jj),[-5 -3])\*gaussmf(Y(ii,jj),[-0.2 0]);%MuANN,MuBs

w3=zmf(X(ii,jj),[-5 -3])\*trimf(Y(ii,jj),[0 1 1]);%MuANN,MuCp

w4=trapmf(X(ii,jj),[-5 -3 -2 0])\*trapmf(Y(ii,jj),[-1 -1 -0.4 0.4]);%MuBN,MuAn

w5=trapmf(X(ii,jj),[-5 -3 -2 0])\*gaussmf(Y(ii,jj),[-0.2 0]);%MuBN,MuBs

w6=trapmf(X(ii,jj),[-5 -3 -2 0])\*trimf(Y(ii,jj),[0 1 1]);%MuBN,MuCp

w7=gaussmf(X(ii,jj),[-.6 0])\*trapmf(Y(ii,jj),[-1 -1 -0.4 0.4]);%MuCSFR,MuAn

w8=gaussmf(X(ii,jj),[-.6 0])\*gaussmf(Y(ii,jj),[-0.2 0]);%MuCSFR,MuBs

w9=gaussmf(X(ii,jj),[-.6 0])\*trimf(Y(ii,jj),[0 1 1]);%MuCSFR,MuCp

w10=trimf(X(ii,jj),[0.5 2.5 4.5])\*trapmf(Y(ii,jj),[-1 -1 -0.4 0.4]);%MuDP,MuAn

w11=trimf(X(ii,jj),[0.5 2.5 4.5])\*gaussmf(Y(ii,jj),[-0.2 0]);%MuDP,MuBs

w12=trimf(X(ii,jj),[0.5 2.5 4.5])\*trimf(Y(ii,jj),[0 1 1]);%MuDP,MuCp

w13=smf(X(ii,jj),[3 5])\*trapmf(Y(ii,jj),[-1 -1 -0.4 0.4]);%MuEPP,MuAn

w14=smf(X(ii,jj),[3 5])\*gaussmf(Y(ii,jj),[-0.2 0]);%MuEPP,MuBs

w15=smf(X(ii,jj),[3 5])\*trimf(Y(ii,jj),[0 1 1]);%MuEPP,MuCp

%Kurallar

CK1=w1\*MuACK;

CK2=w2\*MuACK;

K1=w3\*MuBK;

O1=w4\*MuCO;

B1=w5\*MuDB;

CK3=w6\*MuACK;

K2=w7\*MuBK;

O2=w8\*MuCO;

B2=w9\*MuDB;

CB1=w10\*MuECB;

K3=w11\*MuBK;

O3=w12\*MuCO;

B3=w13\*MuDB;

CB2=w14\*MuECB;

CB3=w15\*MuECB;

SonucUF=max(CK1,max(CK2,max(K1,max(O1,max(B1,max(CK3,max(K2,max(O2,max(B2,max(CB1,max(K3,max(O3,max(B3,max(CB2,CB3))))))))))))));

Z(ii,jj)=(SonucUF\*z')/sum(SonucUF);

end

end

hold off,figure(2);

surf(X,Y,Z);

xlabel('X');

ylabel('Y');

zlabel('Z');

title('T-norm Cebirsel Çarpım ve S-norm max Mamdani Üç Boyutlu Grafiği');

Odev\_3\_Tnorm\_min

clc;

clear all;

%%

x=-5:.1:5;

y=-1:.1:1;

z=0:.1:12;

[X,Y] = meshgrid(x,y);

%%

MuANN = zmf(x,[-5 -3]);

figure(1);

subplot(3,1,1);

plot(x,MuANN,'g');

%%

MuBN = trapmf(x,[-5 -3 -2 0]);

hold on,plot(x,MuBN,'b');

%%

MuCSFR = gaussmf(x,[-.6 0]);

plot(x,MuCSFR,'k');

%%

MuDP = trimf(x,[0.5 2.5 4.5]);

plot(x,MuDP,'r');

%%

MuEPP = smf(x,[3 5]);

plot(x,MuEPP,'');

xlim([-5.05 5.05]);

ylim([-0.05 1.05]);

legend('NN','N','SFR','P','PP');

xlabel('e');

ylabel('Mü(e)');

title('Mü e Üf - 1. Giriş Üf''sinin İlk Hali');

%%

hold off;

subplot(3,1,2);

MuAn = trapmf(y,[-1 -1 -0.4 0.4]);

plot(y,MuAn,'g');

%%

MuBs = gaussmf(y,[-0.2 0]);

hold on,plot(y,MuBs,'b');

%%

MuCp = trimf(y,[0 1 1]);

plot(y,MuCp,'r');

xlim([-1.05 1.05]);

ylim([-0.05 1.05]);

legend('n','s','p');

xlabel('Delta e');

ylabel('Mü(Delta e)');

title('Mü Delta e Üf - 2. Giriş Üf''si');

%%

hold off;

subplot(3,1,3);

MuACK = zmf(z,[1 2]);

plot(z,MuACK,'g');

%%

MuBK = trapmf(z,[1 2 3 4]);

hold on,plot(z,MuBK,'b');

%%

MuCO = trimf(z,[3 5 7]);

plot(z,MuCO,'k');

%%

MuDB = gaussmf(z,[0.85 6.5]);

plot(z,MuDB,'r');

%%

MuECB = smf(z,[7 9]);

plot(z,MuECB,'');

xlim([-0.05 12.05]);

ylim([-0.05 1.05]);

legend('CK','K','O','B','CB');

xlabel('u');

ylabel('Mü(u)');

title('Mü u - Çıkış Üf''sinin İlk Hali');

%%

[aa,bb]=size(X);

%%[cc,dd]=size(Y);

for ii=1:aa

for jj=1:bb%%cc,dd

%Aktiflik Dereceleri

w1=min(zmf(X(ii,jj),[-5 -3]),trapmf(Y(ii,jj),[-1 -1 -0.4 0.4]));%MuANN,MuAn

w2=min(zmf(X(ii,jj),[-5 -3]),gaussmf(Y(ii,jj),[-0.2 0]));%MuANN,MuBs

w3=min(zmf(X(ii,jj),[-5 -3]),trimf(Y(ii,jj),[0 1 1]));%MuANN,MuCp

w4=min(trapmf(X(ii,jj),[-5 -3 -2 0]),trapmf(Y(ii,jj),[-1 -1 -0.4 0.4]));%MuBN,MuAn

w5=min(trapmf(X(ii,jj),[-5 -3 -2 0]),gaussmf(Y(ii,jj),[-0.2 0]));%MuBN,MuBs

w6=min(trapmf(X(ii,jj),[-5 -3 -2 0]),trimf(Y(ii,jj),[0 1 1]));%MuBN,MuCp

w7=min(gaussmf(X(ii,jj),[-.6 0]),trapmf(Y(ii,jj),[-1 -1 -0.4 0.4]));%MuCSFR,MuAn

w8=min(gaussmf(X(ii,jj),[-.6 0]),gaussmf(Y(ii,jj),[-0.2 0]));%MuCSFR,MuBs

w9=min(gaussmf(X(ii,jj),[-.6 0]),trimf(Y(ii,jj),[0 1 1]));%MuCSFR,MuCp

w10=min(trimf(X(ii,jj),[0.5 2.5 4.5]),trapmf(Y(ii,jj),[-1 -1 -0.4 0.4]));%MuDP,MuAn

w11=min(trimf(X(ii,jj),[0.5 2.5 4.5]),gaussmf(Y(ii,jj),[-0.2 0]));%MuDP,MuBs

w12=min(trimf(X(ii,jj),[0.5 2.5 4.5]),trimf(Y(ii,jj),[0 1 1]));%MuDP,MuCp

w13=min(smf(X(ii,jj),[3 5]),trapmf(Y(ii,jj),[-1 -1 -0.4 0.4]));%MuEPP,MuAn

w14=min(smf(X(ii,jj),[3 5]),gaussmf(Y(ii,jj),[-0.2 0]));%MuEPP,MuBs

w15=min(smf(X(ii,jj),[3 5]),trimf(Y(ii,jj),[0 1 1]));%MuEPP,MuCp

%Kurallar

CK1=min(w1,MuACK);

CK2=min(w2,MuACK);

K1=min(w3,MuBK);

O1=min(w4,MuCO);

B1=min(w5,MuDB);

CK3=min(w6,MuACK);

K2=min(w7,MuBK);

O2=min(w8,MuCO);

B2=min(w9,MuDB);

CB1=min(w10,MuECB);

K3=min(w11,MuBK);

O3=min(w12,MuCO);

B3=min(w13,MuDB);

CB2=min(w14,MuECB);

CB3=min(w15,MuECB);

SonucUF=max(CK1,max(CK2,max(K1,max(O1,max(B1,max(CK3,max(K2,max(O2,max(B2,max(CB1,max(K3,max(O3,max(B3,max(CB2,CB3))))))))))))));

Z(ii,jj)=(SonucUF\*z')/sum(SonucUF);

end

end

hold off,figure(2);

surf(X,Y,Z);

xlabel('X');

ylabel('Y');

zlabel('Z');

title('T-norm min ve S-norm max Mamdani Üç Boyutlu Grafiği');

Odev\_4\_Tnorm\_Cebirsel\_Carpim

clc;

clear all;

%%

x=-4:.1:4;

y=-5:.1:5;

[X,Y] = meshgrid(x,y);

%%

MuAK = zmf(x,[-0.5 -3]);

figure(1);

subplot(2,1,1);

plot(x,MuAK,'g');

%%

MuAO = gaussmf(x,[2 0]);

hold on,plot(x,MuAO,'b');

%%

MuAB = smf(x,[0.5 3]);

plot(x,MuAB,'k');

xlim([-4.05 4.05]);

ylim([-0.05 1.05]);

legend('K','O','B');

xlabel('x');

ylabel('Mü(x)');

title('Mü(x) Üf - 1. Giriş Üf''si');

%%

hold off;

MuBN = zmf(y,[-1/8 -4]);

subplot(2,1,2);

plot(y,MuBN,'g');

%%

MuBZ = gaussmf(y,[1 0]);

hold on,plot(y,MuBZ,'b');

%%

MuBP = smf(y,[1/8 4]);

plot(y,MuBP,'k');

xlim([-5.05 5.05]);

ylim([-.05 1.05]);

legend('N','Z','P');

xlabel('y');

ylabel('Mü(y)');

title('Mü(y) Üf - 2. Giriş Üf''si');

%%

%[cc,dd]=size(X);

[aa,bb]=size(Y);

for ii=1:aa

for jj=1:bb

%Aktiflik Dereceleri

w1=zmf(X(ii,jj),[-0.5 -3])\*zmf(Y(ii,jj),[-1/8 -4]);%MuAK,MuBN

w2=zmf(X(ii,jj),[-0.5 -3])\*gaussmf(Y(ii,jj),[1 0]);%MuAK,MuBZ

w3=zmf(X(ii,jj),[-0.5 -3])\*smf(Y(ii,jj),[1/8 4]);%MuAK,MuBP

w4=gaussmf(X(ii,jj),[2 0])\*zmf(Y(ii,jj),[-1/8 -4]);%MuAO,MuBN

w5=gaussmf(X(ii,jj),[2 0])\*gaussmf(Y(ii,jj),[1 0]);%MuAO,MuBZ

w6=gaussmf(X(ii,jj),[2 0])\*smf(Y(ii,jj),[1/8 4]);%MuAO,MuBP

w7=smf(X(ii,jj),[0.5 3])\*zmf(Y(ii,jj),[-1/8 -4]);%MuAB,MuBN

w8=smf(X(ii,jj),[0.5 3])\*gaussmf(Y(ii,jj),[1 0]);%MuAB,MuBZ

w9=smf(X(ii,jj),[0.5 3])\*smf(Y(ii,jj),[1/8 4]);%MuAB,MuBP

%Kurallar

z1=-X(ii,jj)+Y(ii,jj)+1;

z2=2\*X(ii,jj)-Y(ii,jj)+3;

z3=-X(ii,jj)+2\*Y(ii,jj)-3;

z4=X(ii,jj)+Y(ii,jj)+2;

z5=-X(ii,jj)-Y(ii,jj)-2;

z6=-6\*Y(ii,jj);

z7=7\*X(ii,jj)-0.5;

z8=8\*X(ii,jj);

z9=1.8;

Z(ii,jj)=(w1\*z1+w2\*z2+w3\*z3+w4\*z4+w5\*z5+w6\*z6+w7\*z7+w8\*z8+w9\*z9)/(w1+w2+w3+w4+w5+w6+w7+w8+w9);

end

end

hold off,figure(2);

surf(X,Y,Z);

xlabel('X');

ylabel('Y');

zlabel('Z');

title('T-norm Cebirsel Çarpım ile Takagi - Sugeno - Kang Üç Boyutlu Grafiği');