Opláštění kontur

```matlab
rez1 = [1 9 7 9 7 13 1 13; %1
        8 1 14 1 14 8 8 8]; %2
rez2 = [1 11 5 11 5 15 1 15; %3
        1 6 5 6 5 10 1 10; %4
        7 1 15 1 15 5 7 5]; %5
rez3 = [2 10 6 10 6 14 2 14; %6
        7 10 11 10 11 14 7 14; %7
        3 5 7 5 7 9 3 9; %8
        10 1 14 1 14 6 10 6]; %9
rez4 = [2 8 8 8 8 14 2 14; %10
        10 2 14 2 14 6 10 6]; %11
rez5 = [2 10 6 10 6 15 2 15; %12
        10 3 15 3 15 7 10 7]; %13
rez6 = [9 3 13 3 13 7 7 7]; %14

n1 = ["1" "2"];
n2 = ["3" "4" "5"];
n3 = ["6" "7" "8" "9"];
n4 = ["10" "11"];
n5 = ["12" "13"];
n6 = ["14"];

obsahy = cell([32,3]);

index = 1;

K1 = rez1;
K2 = rez2;
nazev1 = n1;
nazev2 = n2;
for i = 1 : size(K1,1)
    for j = 1 : size(K2)
        % prunik
        if(prunik(K1(i,:),K2(j,:))==false) %nemaji prunik
            obsahy{index,1} =  nazev1(i);
            obsahy{index,2} =  nazev2(j);
            obsahy{index,3} =  0;
            index = index + 1;
        else
            K = [max(K1(i,1), K2(j,1)), max(K1(i,2), K2(j,2)),...
                 min(K1(i,3), K2(j,3)), max(K1(i,4), K2(j,4)), ...
                 min(K1(i,5), K2(j,5)), min(K1(i,6), K2(j,6)), ...
                 max(K1(i,7), K2(j,7)), min(K1(i,8), K2(j,8))];
            S1 = (K1(i,3) - K1(i,1))*(K1(i,6) - K1(i,4));
            S2 = (K2(j,3) - K2(j,1))*(K2(j,6) - K2(j,4));
            S = (K(3) - K(1))*(K(6) - K(4));
            obsahy{index,1} =  nazev1(i);
            obsahy{index,2} =  nazev2(j);
            obsahy{index,3} =  max(0,S/min(S1,S2));
            index = index + 1;
        end
```

```matlab
        end
end


K1 = rez2;
K2 = rez3;
nazev1 = n2;
nazev2 = n3;
for i = 1 : size(K1,1)
    for j = 1 : size(K2)
        % prunik
        if(prunik(K1(i,:),K2(j,:))==false) %nemaji prunik
            obsahy{index,1} =  nazev1(i);
            obsahy{index,2} =  nazev2(j);
            obsahy{index,3} =  0;
            index = index + 1;
        else
            K = [max(K1(i,1), K2(j,1)), max(K1(i,2), K2(j,2)),...
                 min(K1(i,3), K2(j,3)), max(K1(i,4), K2(j,4)), ...
                 min(K1(i,5), K2(j,5)), min(K1(i,6), K2(j,6)), ...
                 max(K1(i,7), K2(j,7)), min(K1(i,8), K2(j,8))];
            S1 = (K1(i,3) - K1(i,1))*(K1(i,6) - K1(i,4));
            S2 = (K2(j,3) - K2(j,1))*(K2(j,6) - K2(j,4));
            S = (K(3) - K(1))*(K(6) - K(4));
            obsahy{index,1} =  nazev1(i);
            obsahy{index,2} =  nazev2(j);
            obsahy{index,3} =  max(0,S/min(S1,S2));
            index = index + 1;
        end
    end
end


K1 = rez3;
K2 = rez4;
nazev1 = n3;
nazev2 = n4;
for i = 1 : size(K1,1)
    for j = 1 : size(K2)
        % prunik
        if(prunik(K1(i,:),K2(j,:))==false) %nemaji prunik
            obsahy{index,1} =  nazev1(i);
            obsahy{index,2} =  nazev2(j);
            obsahy{index,3} =  0;
            index = index + 1;
        else
            K = [max(K1(i,1), K2(j,1)), max(K1(i,2), K2(j,2)),...
                 min(K1(i,3), K2(j,3)), max(K1(i,4), K2(j,4)), ...
                 min(K1(i,5), K2(j,5)), min(K1(i,6), K2(j,6)), ...
                 max(K1(i,7), K2(j,7)), min(K1(i,8), K2(j,8))];
            S1 = (K1(i,3) - K1(i,1))*(K1(i,6) - K1(i,4));
            S2 = (K2(j,3) - K2(j,1))*(K2(j,6) - K2(j,4));
            S = (K(3) - K(1))*(K(6) - K(4));
            obsahy{index,1} =  nazev1(i);
            obsahy{index,2} =  nazev2(j);
```

```matlab
                obsahy{index,3} =  max(0,S/min(S1,S2));
                index = index + 1;
            end
        end
end

K1 = rez4;
K2 = rez5;
nazev1 = n4;
nazev2 = n5;
for i = 1 : size(K1,1)
    for j = 1 : size(K2)
        % prunik
        if(prunik(K1(i,:),K2(j,:))==false) %nemaji prunik
            obsahy{index,1} =  nazev1(i);
            obsahy{index,2} =  nazev2(j);
            obsahy{index,3} =  0;
            index = index + 1;
        else
            K = [max(K1(i,1), K2(j,1)), max(K1(i,2), K2(j,2)),...
                 min(K1(i,3), K2(j,3)), max(K1(i,4), K2(j,4)), ...
                 min(K1(i,5), K2(j,5)), min(K1(i,6), K2(j,6)), ...
                 max(K1(i,7), K2(j,7)), min(K1(i,8), K2(j,8))];
            S1 = (K1(i,3) - K1(i,1))*(K1(i,6) - K1(i,4));
            S2 = (K2(j,3) - K2(j,1))*(K2(j,6) - K2(j,4));
            S = (K(3) - K(1))*(K(6) - K(4));
            obsahy{index,1} =  nazev1(i);
            obsahy{index,2} =  nazev2(j);
            obsahy{index,3} =  max(0,S/min(S1,S2));
            index = index + 1;
        end
    end
end

K1 = rez5;
K2 = rez6;
nazev1 = n5;
nazev2 = n6;
for i = 1 : size(K1,1)
    for j = 1 : size(K2)
        % prunik
        if(prunik(K1(i,:),K2(j,:))==false) %nemaji prunik
            obsahy{index,1} =  nazev1(i);
            obsahy{index,2} =  nazev2(j);
            obsahy{index,3} =  0;
            index = index + 1;
        else
            K = [max(K1(i,1), K2(j,1)), max(K1(i,2), K2(j,2)),...
                 min(K1(i,3), K2(j,3)), max(K1(i,4), K2(j,4)), ...
                 min(K1(i,5), K2(j,5)), min(K1(i,6), K2(j,6)), ...
                 max(K1(i,7), K2(j,7)), min(K1(i,8), K2(j,8))];
            S1 = (K1(i,3) - K1(i,1))*(K1(i,6) - K1(i,4));
            S2 = (K2(j,3) - K2(j,1))*(K2(j,6) - K2(j,4));
            S = (K(3) - K(1))*(K(6) - K(4));
```

```
                obsahy{index,1} =  nazev1(i);
                obsahy{index,2} =  nazev2(j);
                obsahy{index,3} =  max(0,S/min(S1,S2));
                index = index + 1;
            end
        end
end
obsahy
```

obsahy = 32×3 cell

	1	2	3
1	"1"	"3"	0.5000
2	"1"	"4"	0.2500
3	"1"	"5"	0
4	"2"	"3"	0
5	"2"	"4"	0
6	"2"	"5"	0.7500
7	"3"	"6"	0.5625
8	"3"	"7"	0
9	"3"	"8"	0
10	"3"	"9"	0
11	"4"	"6"	0
12	"4"	"7"	0
13	"4"	"8"	0.3750
14	"4"	"9"	0

⋮

Strom minimimálního pokrytí kontur

- vzdálenost středů

```
% stredy kotur
K1 = [4 11; 11 6.5];
K2 = [3 13; 3 8; 11 3];
K3 = [4 12; 9 12; 5 7; 12 3.5];
K4 = [5 11; 12 4];
K5 = [4 12.5; 12.5 5];
K6 = [11 5];

graf = zeros(14);

% K1 K2
```

```matlab
    for i = 1 : size(K1,1)
        for j = 1 : size(K2,1)
            d = sqrt((K2(j,1)-K1(i,1))^2+(K2(j,2)-K1(i,2))^2);
            graf(i, j+2) = d;
        end
    end

% K2 K3
for i = 1 : size(K2,1)
    for j = 1 : size(K3,1)
        d = sqrt((K3(j,1)-K2(i,1))^2+(K3(j,2)-K2(i,2))^2);
        graf(i+2, j+5) = d;
    end
end

% K3 K4
 for i = 1 : size(K3,1)
    for j = 1 : size(K4,1)
        d = sqrt((K4(j,1)-K3(i,1))^2+(K4(j,2)-K3(i,2))^2);
        graf(i+5, j+9) = d;
    end
 end

% K4 K5
for i = 1 : size(K4,1)
    for j = 1 : size(K5,1)
        d = sqrt((K5(j,1)-K4(i,1))^2+(K5(j,2)-K4(i,2))^2);
        graf(i+9, j+11) = d;
    end
end

% K5 K6
for i = 1 : size(K5,1)
    for j = 1 : size(K6,1)
        d = sqrt((K6(j,1)-K5(i,1))^2+(K6(j,2)-K5(i,2))^2);
        graf(i+11, j+13) = d;
    end
end

g = graph(graf,'upper');
plot(g,'EdgeLabel',round(g.Edges.Weight,2));
```
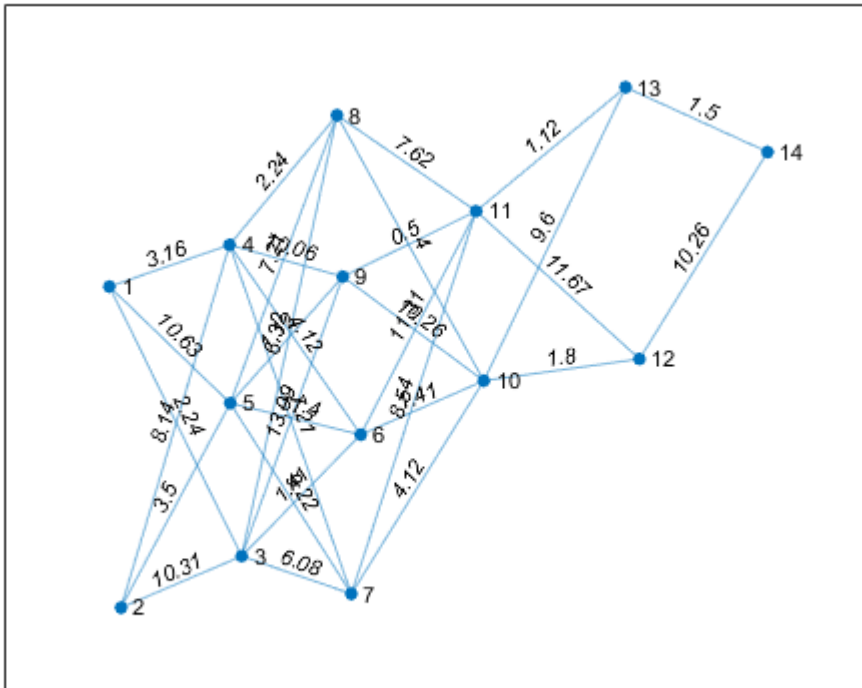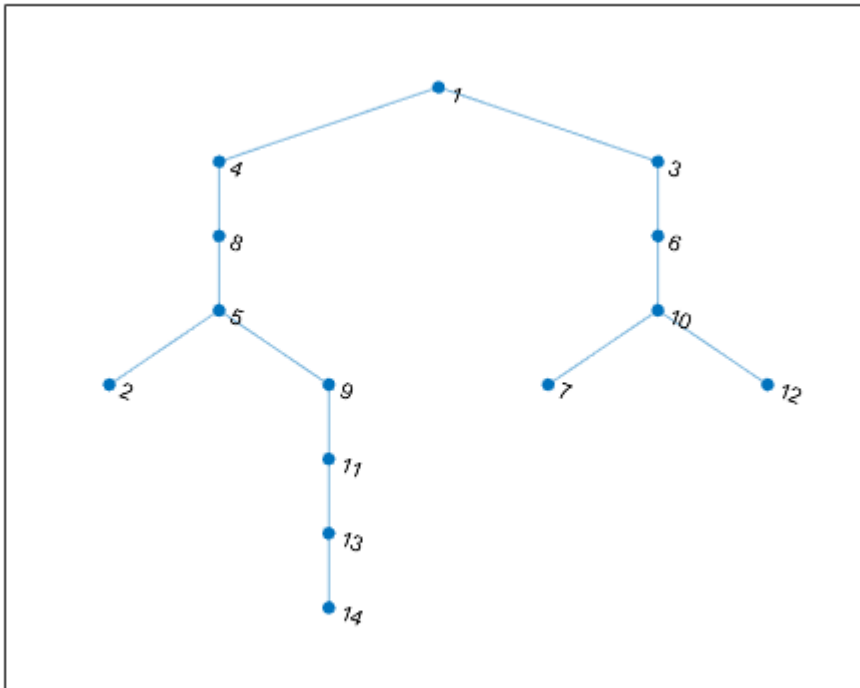
```
h = minspantree(g);
plot(h);
```

Propojení kontur

- minimální povrch

```matlab
K1 = [1 9;7 9; 7 13; 1 13];
K3 = [1 11; 5 11;5 15; 1 15];
nazvev1 = ['A' 'B' 'C' 'D'];
nazvev2 = ['E' 'F' 'G' 'H'];

vzdalenost = 2;
obsahy = cell([32,4]);
index = 1;
for i = 1 : 3
    for j = 1 : 4
        a = sqrt((K1(i,1)-K1(i+1,1))^2 + (K1(i,2)-K1(i+1,2))^2);
        b = sqrt((K1(i,1)-K3(j,1))^2 + (K1(i,2)-K3(j,2))^2 + (vzdalenost)^2);
        c = sqrt((K1(i+1,1)-K3(j,1))^2 + (K1(i+1,2)-K3(j,2))^2 + (vzdalenost)^2);

        s = (a + b + c)/2;
        obsah = sqrt(s*(s-a)*(s-b)*(s-c));
        obsahy{index,1} = nazvev1(i);
        obsahy{index,2} = nazvev1(i+1);
        obsahy{index,3} =  nazvev2(j);
        obsahy{index,4} =  obsah;
        index = index + 1;
    end
```

7

```
end

for j = 1 : 4
        i = 4;
        k = 1;
        a = sqrt((K1(i,1)-K1(k,1))^2 + (K1(i,2)-K1(k,2))^2);
        b = sqrt((K1(i,1)-K3(j,1))^2 + (K1(i,2)-K3(j,2))^2 + (vzdalenost)^2);
        c = sqrt((K1(k,1)-K3(j,1))^2 + (K1(k,2)-K3(j,2))^2 + (vzdalenost)^2);

        s = (a + b + c)/2;
        obsah = sqrt(s*(s-a)*(s-b)*(s-c));
        obsahy{index,1} = nazvev1(i);
        obsahy{index,2} = nazvev1(k);
        obsahy{index,3} =  nazvev2(j);
        obsahy{index,4} =  obsah;
         index = index + 1;
end

for i = 1 : 3
    for j = 1 : 4
        a = sqrt((K3(i,1)-K3(i+1,1))^2 + (K3(i,2)-K3(i+1,2))^2);
        b = sqrt((K3(i,1)-K1(j,1))^2 + (K3(i,2)-K1(j,2))^2 + (vzdalenost)^2);
        c = sqrt((K3(i+1,1)-K1(j,1))^2 + (K3(i+1,2)-K1(j,2))^2 + (vzdalenost)^2);

        s = (a + b + c)/2;
        obsah = sqrt(s*(s-a)*(s-b)*(s-c));
        obsahy{index,1} = nazvev2(i);
        obsahy{index,2} = nazvev2(i+1);
        obsahy{index,3} =  nazvev1(j);
        obsahy{index,4} =  obsah;
        index = index + 1;
    end
end

for j = 1 : 4
        i = 4;
        k = 1;
        a = sqrt((K3(i,1)-K3(k,1))^2 + (K3(i,2)-K3(k,2))^2);
        b = sqrt((K3(i,1)-K1(j,1))^2 + (K3(i,2)-K1(j,2))^2 + (vzdalenost)^2);
        c = sqrt((K3(k,1)-K1(j,1))^2 + (K3(k,2)-K1(j,2))^2 + (vzdalenost)^2);

        s = (a + b + c)/2;
        obsah = sqrt(s*(s-a)*(s-b)*(s-c));
        obsahy{index,1} = nazvev2(i);
        obsahy{index,2} = nazvev2(k);
        obsahy{index,3} =  nazvev1(j);
        obsahy{index,4} =  obsah;
         index = index + 1;
end

obsahy
```

obsahy = 32×4 cell

	1	2	3	4
1	'A'	'B'	'E'	8.4853
2	'A'	'B'	'F'	8.4853
3	'A'	'B'	'G'	18.9737
4	'A'	'B'	'H'	18.9737
5	'B'	'C'	'E'	12.6491
6	'B'	'C'	'F'	5.6569
7	'B'	'C'	'G'	5.6569
8	'B'	'C'	'H'	12.6491
9	'C'	'D'	'E'	8.4853
10	'C'	'D'	'F'	8.4853
11	'C'	'D'	'G'	8.4853
12	'C'	'D'	'H'	8.4853
13	'D'	'A'	'E'	4.0000
14	'D'	'A'	'F'	8.9443

⋮
⋮

Propojení kontur K2 a K5

- minimální povrch

```
K2 = [8 1; 14 1; 14 8; 8 8];
K5 = [7 1; 15 1; 15 5; 7 5];
nazvev1 = ['A' 'B' 'C' 'D'];
nazvev2 = ['E' 'F' 'G' 'H'];

vzdalenost = 2;
obsahy = cell([32,4]);
index = 1;

K1 = K2;
K3 = K5;
for i = 1 : 3
    for j = 1 : 4
        a = sqrt((K1(i,1)-K1(i+1,1))^2 + (K1(i,2)-K1(i+1,2))^2);
        b = sqrt((K1(i,1)-K3(j,1))^2 + (K1(i,2)-K3(j,2))^2 + (2)^2);
        c = sqrt((K1(i+1,1)-K3(j,1))^2 + (K1(i+1,2)-K3(j,2))^2 + (2)^2);

        s = (a + b + c)/2;
        obsah = sqrt(s*(s-a)*(s-b)*(s-c));
        obsahy{index,1} = nazvev1(i);
        obsahy{index,2} = nazvev1(i+1);
```

```matlab
        obsahy{index,3} =  nazvev2(j);
        obsahy{index,4} =  obsah;
        index = index + 1;
    end
end

for j = 1 : 4
        i = 4;
        k = 1;
        a = sqrt((K1(i,1)-K1(k,1))^2 + (K1(i,2)-K1(k,2))^2);
        b = sqrt((K1(i,1)-K3(j,1))^2 + (K1(i,2)-K3(j,2))^2 + (2)^2);
        c = sqrt((K1(k,1)-K3(j,1))^2 + (K1(k,2)-K3(j,2))^2 + (2)^2);

        s = (a + b + c)/2;
        obsah = sqrt(s*(s-a)*(s-b)*(s-c));
        obsahy{index,1} = nazvev1(i);
        obsahy{index,2} = nazvev1(k);
        obsahy{index,3} =  nazvev2(j);
        obsahy{index,4} =  obsah;
         index = index + 1;
end

for i = 1 : 3
    for j = 1 : 4
        a = sqrt((K3(i,1)-K3(i+1,1))^2 + (K3(i,2)-K3(i+1,2))^2);
        b = sqrt((K3(i,1)-K1(j,1))^2 + (K3(i,2)-K1(j,2))^2 + (2)^2);
        c = sqrt((K3(i+1,1)-K1(j,1))^2 + (K3(i+1,2)-K1(j,2))^2 + (2)^2);

        s = (a + b + c)/2;
        obsah = sqrt(s*(s-a)*(s-b)*(s-c));
        obsahy{index,1} = nazvev2(i);
        obsahy{index,2} = nazvev2(i+1);
        obsahy{index,3} =  nazvev1(j);
        obsahy{index,4} =  obsah;
        index = index + 1;
    end
end

for j = 1 : 4
        i = 4;
        k = 1;
        a = sqrt((K3(i,1)-K3(k,1))^2 + (K3(i,2)-K3(k,2))^2);
        b = sqrt((K3(i,1)-K1(j,1))^2 + (K3(i,2)-K1(j,2))^2 + (2)^2);
        c = sqrt((K3(k,1)-K1(j,1))^2 + (K3(k,2)-K1(j,2))^2 + (2)^2);

        s = (a + b + c)/2;
        obsah = sqrt(s*(s-a)*(s-b)*(s-c));
        obsahy{index,1} = nazvev2(i);
        obsahy{index,2} = nazvev2(k);
        obsahy{index,3} =  nazvev1(j);
        obsahy{index,4} =  obsah;
         index = index + 1;
end
```

obsahy

obsahy = 32×4 cell

	1	2	3	4
1	'A'	'B'	'E'	6.0000
2	'A'	'B'	'F'	6.0000
3	'A'	'B'	'G'	13.4164
4	'A'	'B'	'H'	13.4164
5	'B'	'C'	'E'	25.4804
6	'B'	'C'	'F'	7.8262
7	'B'	'C'	'G'	7.8262
8	'B'	'C'	'H'	25.4804
9	'C'	'D'	'E'	21.8403
10	'C'	'D'	'F'	21.8403
11	'C'	'D'	'G'	10.8167
12	'C'	'D'	'H'	10.8167
13	'D'	'A'	'E'	7.8262
14	'D'	'A'	'F'	25.4804

⋮

Propojení kontur

- směr přiřazení

```
K1 = [1 9;7 9; 7 13; 1 13];
K3 = [1 11; 5 11;5 15; 1 15];
nazvev1 = ['A' 'B' 'C' 'D'];
nazvev2 = ['E' 'F' 'G' 'H'];

S1 = [4,11,0];
S2 = [3,13,1];

s = (S2 - S1)
```

s = 1×3
   -1   2   1

```
vzdalenost = 2;
smernice = cell([16,4]);
index = 1;
for i = 1 : 4
    for j = 1 : 4
```

11

```
        s2 = [K3(j, 1)  - K1(i, 1), K3(j,+ 2)  -  K1(i,+ 2),1];
        smernice{index,1} = nazvev1(i);
        smernice{index,2} =  nazvev2(j);
        smernice{index,3} =  s2;

        CosTheta = max(min(dot(s,s2)/(norm(s)*norm(s2)),1),-1);
        ThetaInDegrees = real(acosd(CosTheta));

        smernice{index,4} =  ThetaInDegrees;
        index = index + 1;
    end
end

smernice
```

smernice = 16×4 cell

	1	2	3	4
1	'A'	'E'	[0,2,1]	24.0948
2	'A'	'F'	[4,2,1]	84.8889
3	'A'	'G'	[4,6,1]	59.6889
4	'A'	'H'	[0,6,1]	29.2492
5	'B'	'E'	[-6,2,1]	45.4658
6	'B'	'F'	[-2,2,1]	17.7155
7	'B'	'G'	[-2,6,1]	16.9882
8	'B'	'H'	[-6,6,1]	24.7894
9	'C'	'E'	[-6,-2,1]	78.9729
10	'C'	'F'	[-2,-2,1]	97.8212
11	'C'	'G'	[-2,2,1]	17.7155
12	'C'	'H'	[-6,2,1]	45.4658
13	'D'	'E'	[0,-2,1]	123.2109
14	'D'	'F'	[4,-2,1]	128.5802

⋮

```
function [vystup] = prunik(A,B)
    vystup = false;
    K1 = A;
    K2 = B;
    if(K1(1) >= K2(1) && K1(1) <= K2(3) && K1(2) >= K2(2) && K1(2) <= K2(8))
        vystup = true;
    end
    if(K1(3) >= K2(1) && K1(3) <= K2(3) && K1(2) >= K2(2) && K1(2) <= K2(8))
        vystup = true;
    end
    if(K1(1) >= K2(1) && K1(1) <= K2(3) && K1(8) >= K2(2) && K1(8) <= K2(8))
        vystup = true;
```

```matlab
        end
    if(K1(3) >= K2(1) && K1(3) <= K2(3) && K1(8) >= K2(2) && K1(8) <= K2(8))
        vystup = true;
    end


    K1 = B;
    K2 = A;
    if(K1(1) >= K2(1) && K1(1) <= K2(3) && K1(2) >= K2(2) && K1(2) <= K2(8))
        vystup = true;
    end
    if(K1(3) >= K2(1) && K1(3) <= K2(3) && K1(2) >= K2(2) && K1(2) <= K2(8))
        vystup = true;
    end
    if(K1(1) >= K2(1) && K1(1) <= K2(3) && K1(8) >= K2(2) && K1(8) <= K2(8))
        vystup = true;
    end
    if(K1(3) >= K2(1) && K1(3) <= K2(3) && K1(8) >= K2(2) && K1(8) <= K2(8))
        vystup = true;
    end
end
```