

# THE ALGORITHM YEN

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**Abstract:** In this article are made an implementation of an optimum transport networks using methods very useful Yen type especially as execution times are good and the algorithm adapts very easily to practical situations.

**Key words:** transport, optimizations, mechanics

## 1.Introduction

Get a graph-oriented  $G = (V, M)$  and a function  $c:M \times R \rightarrow r$ . Give a nod to go. Require minimal roads from p to any node node i.

Consider costs associated with a w matrix graf and want to get shorter distance from top to any other.

STAGE 1:

$D=W$

STAGE 2:

$I=1; h(k)=0, h(j0)=1$  pt  $1 \leq j \leq n, j < k$

STAGE 3

Compute  $\min\{d[k,j], 1 \leq j \leq n, h(j)=1\}$

Compute  $j0$  so  $h(j0)=1$  and  $d[k,j0]=\min\{d[k,j], 1 \leq j \leq n, h(j)=1\}$

$B(j0)=d[k,j0], h(j0)=0$

$D[k,j]=\min\{d[k,j], d[k,j0], d[j0,j]\}$ , for all  $j$ ,  $1 \leq j \leq n$ ,

$i=i+1$

STAGE 4:

If  $i < n$  get back to the stage 3 otherwise stop.

Example:

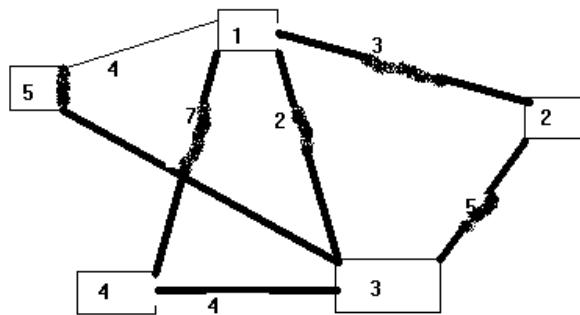


Figure 1

1) write the attached matrix d;

2)i=1,h=(0,1,1,1,1),b(1)=0;

j0=3,b(3)=2,h=(0,1,0,1,1)

$$D = \begin{pmatrix} \infty & 3 & 2 & 6 & 3 \\ 3 & \infty & 5 & \infty & \infty \\ 2 & 5 & \infty & 4 & 1 \\ 7 & \infty & 4 & \infty & \infty \\ 4 & 1 & \infty & \infty & \infty \end{pmatrix}$$

i=2

3)i<5 return to stage 3

j0=2 b(2)=3,h=(0 0 0 1 1 )

.....

{THE ALGORITHM YEN: to determine the shortest distance from a to any other. If no connection is 10000 (a [i, 1] = 0 and is no longer required, for i=1...n)

ex:n=5

3 2 7 4

3 5 10000 1000

2 5 4 1

7 10000 4 10000

4 10000 1 10000

from the knot 1

=> minimum distances

1---->2 e 3

....

}

var d,w:array[1..20,1..20] of real;

k,i,j,n,L,j0:byte;

v,b:array[1..20] of real;

```

min:real;
function minim(x,y:real):real;
begin
if x<y then minim:=x else minim :=y;
end;
begin
writeln('n=');readln(n);
for i:=1 to n do
for j:=1 to n do
if i<>j then
begin
write('w[',i,' ',j,']=');
readln(w[i,j]);
d[i,j]:=w[i,j];
end
else
begin
w[i,j]:=10000;
d[i,j]:=10000;
end;
writeln('varful dorit ');readln(k);
for i:=1 to n do v[i]:=1;
v[k]:=0;b[k]:=0;
for i:=1 to n do
begin
min:=10000;
for j:=1 to n do
if (v[j]=1) and (d[k,j]<min) then begin
j0:=j;
min:=d[k,j];
end;
for j:=1 to n do
d[k,j]:=minim(d[k,j],d[k,j0]+d[j0,j]);
v[j0]:=0;
b[j0]:=d[k,j0];
end;
writeln(' minimum distances from the ',k,' the other peaks ');
for i:=1 to n do
begin
write(k,'----->',i);
writeln(':',b[i]);
end;
readln;
end.

```

## 2. Conclusions

Suppose we have a graph in which all edges have length equal to the number of vertices is n and the edges of m and the connections between knowing that there are edges to determine minimum length between two nodes that you read from the keyboard

### STAGE I:

- start from the end of his neighbours with marches 1-for each next door neighbors with their marches not marches (meaning it marks each node with dad)-as do all

### STAGE II

- If you do I mark and then marking of node x is the minimum distance when I get to it

ex:n=4

m=4

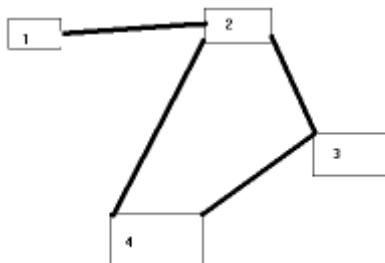


Figure 2

```
var n,m,i,j,nc,nd,ndc:integer;
a:array[1..30,1..30] of 0..1;
costurile:array[1..30] of integer;
procedure parcurginalatimegraful(x:integer);
var p,u,virf,j,costuldelaunnodlaaltul:integer;
c:array[1..30] of integer;
gata:boolean;
begin
p:=1;u:=1;
costurile[x]:=-1;costuldelaunnodlaaltul:=0;c[p]:=x;
gata:=false;
while (p<=u) and not gata do begin
virf:=c[p];
costuldelaunnodlaaltul:=costuldelaunnodlaaltul+1;
for j:=1 to n do
if (a[virf,j]=1) and (costurile[j]=0) then
begin
u:=u+1;c[u]:=j;
costurile[j]:=costuldelaunnodlaaltul;
if j=nd then begin
gata:=true;writeln('lantul are lungimea minima ',costuldelaunnodlaaltul);
end;
end;
end;
```

```

p:=p+1;
end;end;
begin
write(' dati numarul de noduri n=');readln(n);
write(' dati numarul de muchii m=');readln(m);
writeln(' muchiile ');
for i:=1 to m do
begin
writeln('primul nod al muchiei ',i);readln(nc);
writeln('al doile nod al muchiei ',i);readln(nd);
a[nc,nd]:=1; a[nd,nc]:=1;
end;
write('nodul de plecare ');readln(nd);
write('nodul de sosire ');readln(nuc);
parcurnlatimegraful(nuc);
if costurile[nd]=0 then writeln(' nu este lant intre ',nd, ' si nodul ',nuc);
readln;
end.

```

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