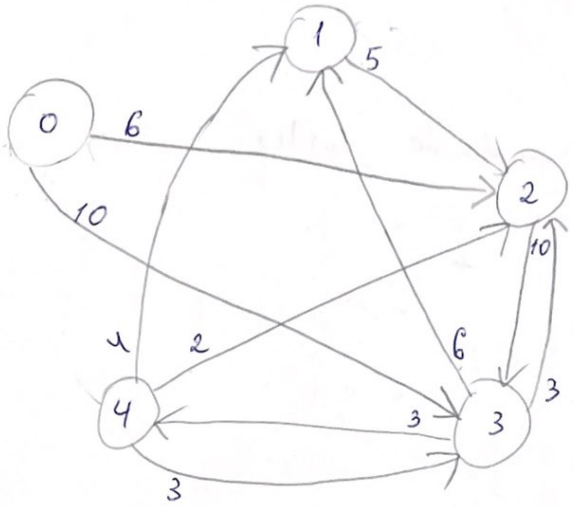
Practical work Nr. 3

Carp Nicoleta
gr. 911

Problem (7)



Floyd-Warshall algorithm: from all to all vertices

Initial matrices:

$$D = \begin{pmatrix} 0 & \infty & 6 & 10 & \infty \\ \infty & 0 & 5 & \infty & \infty \\ \infty & \infty & 0 & 10 & \infty \\ \infty & 6 & 3 & 0 & 3 \\ \infty & 4 & 2 & 3 & 0 \end{pmatrix}$$ - distances

$$P = \begin{pmatrix} - & - & 0 & 0 & - \\ - & - & 1 & - & - \\ - & - & - & 2 & - \\ - & 3 & 3 & - & 3 \\ - & 4 & 4 & 4 & - \end{pmatrix}$$ - previous neighbour

$k=0$ -> using vertex 0 as intermediate vertex

$$D_0 = \begin{pmatrix} 0 & \infty & 6 & 10 & \infty \\ \infty & 0 & 5 & \infty & \infty \\ \infty & \infty & 0 & 10 & \infty \\ \infty & 6 & 3 & 0 & 3 \\ \infty & 4 & 2 & 3 & 0 \end{pmatrix} \qquad P_0 = \begin{pmatrix} - & - & 0 & 0 & - \\ - & - & 1 & - & - \\ - & - & - & 2 & - \\ - & 3 & 3 & - & 3 \\ - & 4 & 4 & 4 & - \end{pmatrix}$$

$k=1$ -> using vertex 1 as intermediate vertex

$$D_1 = \begin{pmatrix} 0 & \infty & 6 & 10 & \infty \\ \infty & 0 & 5 & \infty & \infty \\ \infty & \infty & 0 & 10 & \infty \\ \infty & 6 & 3 & 0 & 3 \\ \infty & 4 & 2 & 3 & 0 \end{pmatrix} \qquad P_1 = \begin{pmatrix} - & - & 0 & 0 & - \\ - & - & 1 & - & - \\ - & - & - & 2 & - \\ - & 3 & 3 & - & 3 \\ - & 4 & 4 & 4 & - \end{pmatrix}$$

$k=2$ -> using vertex 2 as intermediate vertex

$$D_2 = \begin{pmatrix} 0 & \infty & 6 & 10 & \infty \\ \infty & 0 & 5 & \boxed{15} & \infty \\ \infty & \infty & 0 & 10 & \infty \\ \infty & 6 & 3 & 0 & 3 \\ \infty & 4 & 2 & 3 & 0 \end{pmatrix} \qquad P_2 = \begin{pmatrix} - & - & 0 & 0 & - \\ - & - & 1 & \boxed{2} & - \\ - & - & - & 2 & - \\ - & 3 & 3 & - & 3 \\ - & 4 & 4 & 4 & - \end{pmatrix}$$

$k = 3$ -> using vertex 3 as intermediate vertex

$$D_3 = \begin{pmatrix} 0 & \boxed{16} & 6 & 10 & \boxed{13} \\ \infty & 0 & 5 & 15 & \boxed{18} \\ \infty & \boxed{16} & 0 & 10 & \boxed{13} \\ \infty & 6 & 3 & 0 & 3 \\ \infty & 4 & 2 & 3 & 0 \end{pmatrix} \qquad P_3 = \begin{pmatrix} - & \boxed{3} & 0 & 0 & \boxed{3} \\ - & - & 1 & 2 & \boxed{3} \\ - & \boxed{3} & - & 2 & \boxed{3} \\ - & 3 & 3 & - & 3 \\ - & 4 & 4 & 4 & - \end{pmatrix}$$

$k = 4$ -> using vertex 4 as intermediate vertex

$$D_4 = \begin{pmatrix} 0 & 16 & 6 & 10 & 13 \\ \infty & 0 & 5 & 15 & 18 \\ \infty & 16 & 0 & 10 & 13 \\ \infty & 6 & 3 & 0 & 3 \\ \infty & 4 & 2 & 3 & 0 \end{pmatrix} \qquad P_4 = \begin{pmatrix} - & 3 & 0 & 0 & 3 \\ - & - & 1 & 2 & 3 \\ - & 3 & - & 2 & 3 \\ - & 3 & 3 & - & 3 \\ - & 4 & 4 & 4 & - \end{pmatrix}$$

Case of there is no walk:

$D_4(3, 0) = \infty$ => there is no walk from 3 to 0

Case of ther is a walk: $s = 1$ $t = 4$

$D_4(1, 4) = 18$ -> the cost of the walk

$t = 4$, $P_4(1,4) = 3$

$P_4(1,3) = 2$

$P_4(1,2) = 1 = s$ => The walk of minimum cost from 1 to 4 is:

$1 \xrightarrow{5} 2 \xrightarrow{10} 3 \xrightarrow{3} 4$