ABOUT ONE CLASS OF CLUSTERISATION PROBLEMS ON THE NETWORK GRAPH [1]

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Consider an acyclic directed graph $G(V, E)$ with n vertices. For each vertex $v \in V$ there is an initial weight $q(v) > 0$ and also there is its weight $\overline{(q)}(v)$ in a tree $T = T(V', E') \subset G(V; E)$

$$\overline{q}(v) = \begin{cases} q(v) \text{ , if } v \text{ is not a root of } T, \\ (q(v) - \sum\limits_{w \in V' \setminus \{v\}} q(w))^+ \text{ , if } v \text{ is a root of } T, \end{cases}$$

Where $(a)^+ = max(0, a)$. The weight of a tree $T(V', E')$ we define as $\sum\limits_{w \in V'} \overline{q}(w)$.

The problem is to find a subset of edges $\widetilde{E} \subset E$, such that $G(V; \widetilde{E})$ is a directed spanning forest with the minimal total weight.

In paper we proved NP-hardness of a problem in general case, also we defined complexity status on some typical structures of directed graphs, such as: complete acyclic graph, chain, outtree, intree.

Also we discovered two polynomially solvable cases. For problems on chain and on intree with the optimized number of clusters there were constructed exact algorithms with the time complexity $O(n^2)$.

REFERENCES

1. Gimadi E.Kh., Chesnokov D.S., Shin E.Y. *About one class of clusterisation problems on the network graph* — Discrete analysis and operations research. — 2014.

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