Traffic Flow Prediction in Service Networks

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The estimation of traffic flow of service networks becomes a more and more important task nowadays. In the past period, a large number of research has been done to develop flow prediction models, which forecasts the future traffic flows ([1, 2]). Service networks comprise here postal, transportational and communication networks. Postal networks are the direct motivation for this talk.

In such a network, the nodes mark the operations (collection, sorting, delivery) of a flow process, while the edges represent the flow directions. Those nodes which contain just outgoing edges, represent the collection places of the network, while the nodes which have only input edges, represent the distribution (delivery) places. With the mechanization of the postal logistic system, the estimation of the daily loads occurring in the deliverers becomes possible. This automatization provides an efficient facility for counting a large part of the letters.

The problem considered in this talk is how to plan the traffic measurement in the network with minimal cost, if we know the cost of the measurements in the nodes. In the case of a given output node, we are looking for those nodes, which influence the traffic of that output node. We want to ensure a preset precision for the output node values in terms of uncertainty intervals. Our aim is to achieve the result with the smallest measurement cost. Similar optimization problems in postal networks are formulated in ([4, 5]) using different objectives like vehicle factors, time limit and frequency, cost, and so on.

An important task of the investigated problem is the network evaluation. Based on the known data in some node, we can evaluate the whole network in order to update the influenced nodes and edges. The network evaluation is made with the help of interval calculation [3]. Hence, the data in the nodes and along the edges are represented by intervals. During the network evaluation the basic interval arithmetic operations are used and the calculated values are propagated form the input nodes to the output nodes.

In this talk we consider some solution algorithms and compare them on generated test networks.

Acknowledgements. This work was supported by the TÁMOP-4.2.2/08/1/2008-0008 project of the Hungarian National Development Agency.

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