Karlsruher Institut für Technologie

INSTITUTE FOR OPERATIONS RESEARCH

VORträge zum Operations Research

Kolloquium des Instituts für Operations Research

Zeit:	Dienstag, 12.11.2024, 15:45-17:15 Uhr
Ort:	**Online**
Es sprechen:	Prof. Dr. Tanka Nath Dhamala Head, Central Department of Mathematics, Tribhuvan University
	Durga Prasad Khanal Junior Researcher/Investigator, Assistant Professor at Saraswati Multiple Campus, Tribhuvan University
	Hari Nandan Nath Junior Researcher/Investigator, Assistant Professor at Bhaktapur Multiple Campus, Tribhuvan University
	Sachin Wagle PhD Scholar, Assistant Professor at Institute of Engineering Purwanchal Campus, Tribhuvan University

Zu den Themen:

Congestion Minimization under Budget Constraints and Speed Variation
Durga Prasad Khanal and Tanka Nath Dhamala (joint research in collaboration with Stefan Nickel)

We aim to maximize the flow by emphasizing on some techniques to minimize the congestion during evacuation or rush hour traffic. For a given network topology, we first find the bottleneck arcs. Our assumption is that some budget is allocated for the increment of arc capacities which is insufficient to employed for all bottleneck arcs. So, some arcs are to be chosen for budgetallocation and speed variation is applied on rest of the arcs. At the time of disaster, every evacuees may not reach to the final destination in short time slot. Thus, the settlement of evacuees at some appropriate intermediate shelters can be milestone for saving of lives and minimizing the congestion throughout the network. Similarly, in two-way network, reversal of arcs towards the destination is another important issue for flow maximization and congestion reduction because no movement of flow is possible towards the danger zone. In this presentation, we present a combined solution approach to minimize overall traffic congestion.

The Quickest Flow Location Problem

Hari Nandan Nath and Tanka Nath Dhamala (joint research in collaboration with Stefan Nickel)

Placement of facilities in arcs of a transportation network reduces the capacity of the corresponding arcs. This may increase the egress time of the given amount of the flow through the network. Given a set of facilities with given sizes, and a set of arcs to place the facilities such that all the facilities can be adjusted to the arcs, we formulate the quickest flow location problem to allocate the facilities to the arcs so that the increase in the quickest time is as minimum as possible. Such a problem is formulated as a mixed integer programming problem whose objective is non-linear. The problem is proved to be NP-hard having no approximate solution. We linearize the model, and construct polynomial time heuristic algorithms to solve the problem with practically good quality solutions. With a set of arbitrary facilities, we formulate the problem as a bi-criteria problem to minimize the quickest time and maximize the number of assigned facilities. We propose ϵ-constraint based algorithm to find the non-dominated solutions and heuristic algorithms to solve the bi-criteria quickest flow location problem.

Algorithms for Dynamic Multi-Commodity FlowLoc Problem

Sachin Wagle and Tanka Nath Dhamala (joint research in collaboration with Stefan Nickel)

In a classical network topology, the maximum multi-commodity flow problem maximizes the flow of more than one commodity from their respective sources to corresponding sinks without violating the capacity constraints within the given time horizon. The flow location (FlowLoc) problem concerns the minimization of reduction of network´s maximum flow value by fixing the given set of facilities on appropriate location(s). In a two-way network, the flow value may be improved by reversing the direction of arcs towards the sinks only up to the necessary arc capacity (partial contraflow approach).

In this presentation, we integrate the concepts of multi-commodity flow and partial contraflow problems with FlowLoc, introduce the maximum dynamic multi-commodity FlowLoc and the maximum dynamic multi-commodity partial ContraFlowLoc problems for single as well as multiple facilities. We propose their flow models by taking the prioritized multi-commodities. We solve the single facility problem pseudo-polynomially and present a fully polynomial time approximation scheme (FPTAS) using $\Delta-$condensed graph. In the case of multi-facility, the polynomial time heuristic is presented to obtain the near optimal solution. We use the partial contraflow concept to solve the ContraFlowLoc problems for single and multiple facilities.

Die Vorträge zum Operations Research wenden sich an alle Interessierten!

Bei Rückfragen wenden Sie sich bitte an:
Prof. Dr. Stefan Nickel, Institut für Operations Research