Weighted P-Median-Spanning Tree Problem

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Distributed sensor networks are comprised of two components where sensors gather information from the environment and routed to gateways which must share the data load seamlessly. We turn this structure into graphs where sensor-gateway relationship is organized through transportation edge weights and communication between gateways are linked to connection costs. Given that we have p gateways, each node has a sensor demand and a gateway deployment cost, we define a *weighted p-median-spanning tree problem* to find the optimal deployment of p gateways connected by a spanning tree and routing of each sensor to those gateways. We develop a baseline binary integer programming (BIP) model to tackle it. Since the model comprises computationally inefficient cycle elimination constraint, two alternative mixed integer linear programming (MILP) models and procedures based upon separation cuts are devised. We perform a computational analysis to test their performance.

Acknowledgements: The authors gratefully acknowledge the support of the Slovenian Research and Innovation Agency (ARIS) through grants N1-0223, N2-0171 and J2-2504. Balázs Dávid and Miklós Krész have been also supported by the research program CogniCom (0013103) at the University of Primorska. László Hajdu acknowledges the support of University of Primorska through postdoc grant No. 2991-10/2022.