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Optimal location for a path or a tree shaped facilities on networks

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Abstract

Problems of optimization on graphs generally treat a graph structure like a road network and attempt to maximize flow along that along network while minimizing costs. There are many classical optimization problems associated to graphs and this field is sometimes considered a sub-discipline within Combinatorial Optimization. Network optimization has always been a core problem domain in operations research, as well as in computer science, applied mathematics, and many fields of engineering and management. The varied applications in these fields not only occur 'naturally' on some transparent physical network, but also in situations that apparently are quite unrelated to networks. Moreover, because network optimization problems arise in so many diverse problem contexts, applications are scattered throughout the literature in several fields. Consequently, it is sometime difficult for the research and practitioner community to fully appreciate the richness and variety of network applications.

Facility location problems have applications in a wide variety of fields and projects. As examined it can be used to find the optimal location for a store, plant, warehouse, etc. but these formulation methods can also be used is less obvious ways. Applications range from public policy (e.g. locating police officers in a city), telecommunications (e.g. cell towers in a network), and even particle physics (e.g. separation distance between repulsive charges). All of these problems have in common that discrete locations must be chosen and the objective is to meet the demand of consumers or users in the most efficient way. The figure at the right demonstrates an example of how the facility location problem may be used in industry to determine the locations for natural gas transmission equipment. Another case study that has been analyzed was the determination of quantity and location of distribution centers of steel facilities in Latin America .