DOMINATING SETS IN GRAPHS: OPTIMIZATION AND EXTENSIONS

S. Butenko

Texas A&M University, College Station, TX
e-mail: butenko@tamu.edu

This talk will discuss several variations of dominating sets in graphs that are motivated by applications in wireless networks. Given a simple undirected graph, the minimum connected dominating set problem is to find a minimum cardinality subset of vertices D inducing a connected subgraph such that each vertex outside D has at least one neighbor in D. Approximations of minimum connected dominating sets are often used to represent a virtual routing backbone in wireless networks. We consider the following optimization problems dealing with dominating sets in wireless networks:

- The edge-weighted bottleneck connected dominating set problem, which seeks a minimum edge weight in the graph such that the corresponding bottleneck subgraph has a connected dominating set of size k [3, 5].

- The problem of finding a minimum dominating set of restricted diameter, which bounds the distance that information must travel through the network [1].

- A fault-tolerant version of the minimum dominating set problem that, in addition to restricting the diameter enforces a desired connectivity for the set [2].

In addition, we will show how the concept of domination can be used to develop efficient approximation algorithms and scale-reduction procedures for other important problems in wireless networks modeled as unit-disk graphs [4].

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