Limited Packings in Graphs

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Abstract

A set of sensors is to be deployed to covertly monitor a facility. If too many sensors are placed close to any given location in the facility, then it is likely the presence of the sensors will be detected. Where then should the sensors be placed so that the total number we deploy is maximized while at the same time we avoid placing some threshold number close to any given location? There are many similar problems in combinatorial optimization in which the total number of objects to be placed needs to be maximum subject to some local density constraint.

For a positive integer k, a set of vertices S in a graph G is called a **k-limited packing** in G if the closed neighborhood of each vertex w in G contains at most k of the members of S. (When $k = 1$ this is equivalent to saying that the set S is a 2-packing.) The **k-limited packing number** of G is the maximum cardinality of a k-limited packing in G and is denoted $L_k(G)$. In this talk we will derive some of the fundamental properties of this number and provide bounds for its size. In addition we give a characterization of the class of trees T for which $L_2(T)$ is exactly twice the domination number of T. This value, twice the domination number, is an upper bound for the 2-limited packing number in any graph.

This talk concerns joint work with Rob Gallant & Georg Gunther from Newfoundland, and Bert Hartnell from Nova Scotia.