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On the Number of 2-packings in a Connected Graph

There are some famous results in extremal graph theory e.g. on number of maximal clicks in a graph by Moon and Moser [2] or on number of maximal independent sets in a tree by Sagan [3]. In this talk we investigate another interesting problem in extremal graph theory, which was first researched by Havet, Klazar, Kratochvíl, Kratsch and Liedloff [1] in analysis of algorithms for $L(2,1)$-labeling.

A 2-packing is a subset of vertices of a graph, such that no two vertices from this set have a common neighbor. In this talk we discuss the maximum number of 2-packings in a connected graph.

We present the algorithm for generating all 2-packings of a specified size in a connected graph. An analysis of this algorithm provides a new upper bound on the maximum number of such 2-packings, which is $\binom{n-k+1}{k}$, where k denotes a cardinality of each generated 2-packing and n denotes a number of vertices in a graph.

Then we improve our method to generate all 2-packings in a connected graph and obtain a new upper bound on their number – $O^*(1.5399\ldots^n)$. Additionally, we present a lower bound on the maximum number of 2-packings, which is $\Omega^*(1.4977\ldots^n)$.

The application of these results in analysis of algorithms for L(2,1)-labeling will be presented in the the talk *On Improved Exact Algorithm for $L(2,1)$-labeling of Graphs* by Konstanty Junosza-Szaniawski.

References

[1] F. Havet, M. Klazar, J. Kratochvíl, D. Kratsch, M. Liedloff, *Exact Algorithms for $L(2,1)$-Labeling of Graphs* Algorithmica DOI 10.1007/s00453-009-9302-7

[2] J. W. Moon, L. Moser, *On Cliques in Graphs*, Israel Journal of Mathematics 3, 23–28, DOI 10.1007/BF02760024

[3] B. E. Sagan, *A Note on Independent Sets in Trees*, SIAM J. Discrete Math. 1 (1988), 105–108