Uniform partition of graphs: Complexity results, algorithms and formulations[1]

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In this presentation, we address centered and non centered equipartition problems on graphs into p connected components (p-partitions). In the former case, each class of the partition must contain exactly one special vertex called center, whereas in the latter, partitions are not required to fulfil this condition. Among the different equipartition problems considered in the literature, we focus on: 1) Most Uniform Partition (MUP) and 2) Uniform Partition (UP). Both criteria are defined either w.r.t. weights assigned to each vertex or to costs assigned to each vertex-center pair. Costs are assumed to be flat, i.e., they are independent of the topology of the graph. With respect to costs, MUP minimizes the difference between the maximum and minimum cost of the components of a partition and UP refers to optimal min-max or max-min partitions. Additionally, we present various problems of partitioning a vertex-weighted undirected graph into p connected components minimizing the *gap* that is a measure related to the difference between the largest and the smallest vertex weight in the component of the partition.

For all the problems considered here, we provide polynomial time algorithms, as well as, NP-complete results even on very special classes of graphs like trees. For the centered partitioning problems, we also present a new mathematical programming formulation that can be compared with the ones already provided in the literature for similar problems.

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