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DM811 - Heuristics for Combinatorial Optimization

Assignment Sheet 4, Fall 2009

Prepare for class discussion an answer to the following exercises. Work possibly in group. Due date: October 6, 2009.

Exercise 1

Definition 1 Graph Partitioning Problem
Input: *A graph $G = (V, E)$, weights $w(v) \in Z^+$ for each $v \in V$ and $l(e) \in Z^+$ for each $e \in E$.*
Task: *Find a partition of V into disjoint sets $V_1, V_2, \ldots, V_m$ such that $\sum_{v \in V_i} w(v) \leq K$ for $1 \leq i \leq m$ and such that if $E' \subseteq E$ is the set of edges that have their two endpoints in two different sets V_i, then $\sum_{e \in E'} l(e)$ is minimal.*

Consider the specific case of graph bipartitioning, that is, the case $|V| = 2n$ and $w(v) = 1, \forall v \in V$ and $K = n$.

1. Design an (efficient!) variable depth local search algorithm that uses λ-exchanges where λ is not fixed a priori.

Exercise 2

Consider the SAT problem defined at the lecture. Devise:

- preprocessing rules, ie, polynomial time simplification rules
- incremental updates for the local search defined on the flip neighborhood, number of violated clauses as evaluation function and best improvement strategy.