Pseudo Code for Repair Algorithm

Arthur Feng

March 21, 2019

1 Input

- A problem P^0 with n binary variables x, objective function cx (min), constraint set C^0 with an optimal solution x^0.
- A problem P^1 with n binary variables x, objective function cx (min), constraint set C^1, such that $C^0 \subsetneq C^1$.

2 Output

- An optimal solution x^1 to P^1.

3 General Idea

We propose to solve P^1 by reusing the optimal solution x^0 to P^0. In order to achieve this, we define a new problem Q with constraint set C^1 and objective function

$$\min cx + \alpha|x - x^0|,$$

where $|x - x^0| = \sum_{i=0}^{n-1} |x_i - x_i^0|$, and α is a *penalty* term for deviating from the input solution x^0. This would tentatively help the search for a good solution to P^1. However, unless x^0 is feasible for P^1, an optimal solution to Q will in general not be optimal for P^1.

To remedy this problem, we will instead solve a sequence of problems $Q^0, Q^1, \ldots$, where the penalty factor α will gradually decrease until it reaches 0, say at iteration k, in which case $Q^k = P^1$. This sequence of problems can be efficiently solved using a technique called *reoptimisation*, which is implemented in the MIP solver SCIP.

4 Pseudo Code