

Discrete Optimisation

Exercise Session 2: Branch-and-bound, Modelling

September 25, 2015

- Exercise 1** (branch-and-bound tree). 1. Explain the global behaviour of the branch-and-bound algorithm.
2. Give the tightest lower and upper bounds on the optimal value for the objective based on the tree. Compute the gap.
 3. With the given partial tree, give the nodes which should be pruned (and why), and which could be explored further.
 4. Explore Gurobi's MIP log and link it to the branch-and-bound tree.

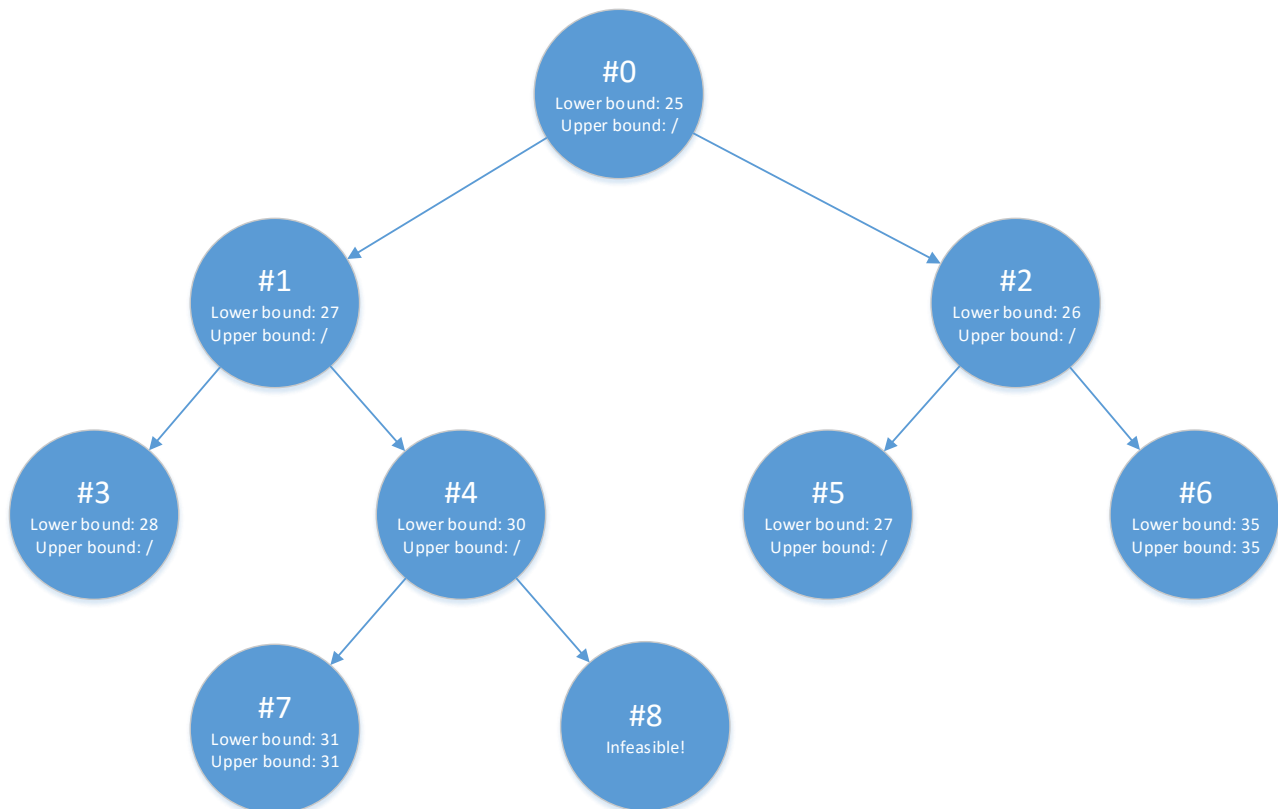


Figure 1: A partial branch-and-bound tree.

Exercise 2 (greatest common divisor). Compute the greatest common divisor (GCD) of a and b , two non-zero natural numbers.

Exercise 3 (volleyball teams). Make teams for a volleyball tournament. Each team has exactly six members.

Then, consider the gender of the players: impose that each team has at least two men and two women.

For the next step, add the notion of level for each player; they are noted on a scale of one to four. Each team must have at least one person for three different levels.

Finally, define the objective: teams must be as similar to each other as possible. More precisely, the total “variance” of the level and presence of each gender must be as low as possible (the objective must remain linear).

Exercise 4 (computer solutions). Solve numerically the previous exercises by writing the model previously found with a modelling tool (such as JuMP, Pyomo, ZIMPL, etc.).