Discrete Optimisation
Exercise Session 4: Formulation Comparison and Modelling

October 16, 2015

Exercise 1 (facility location formulations). The uncapacitated facility location problem deals with the optimal opening of facilities (their position cannot be changed) to meet some demand (always one unit) while minimising the total cost (opening facilities, producing the goods, delivering them to the customers). There is no bound on the amount of goods a facility can produce. A client's demand is always met by ony one facility.

1. Propose two formulations for the uncapacitated facility location.

2. Prove that one is stronger than the other.

3. Implement both formulations and compare the solving times when increasing the size of the problem.

Exercise 2 (attic problem). Your aunt passes away, you and your sister are her only heirs. How to solve inheritance problems? Minimise the unfairness when splitting the heritage (consisting of a list of objects to divide amongst the two of you), computed with various criteria: monetary value, volume, sentimental value. Each of you shall get approximately the same amount for each of these criteria out of the heritage of your late aunt.

However, your notary is in a hurry, and would want the actual distribution rather soon. Why is your model so slow to solve with many objects? What is the value for the first LP relaxation? Find an explanation that your notary could understand.

Later on, you hear about a mysterious hidden child. With the help of your genealogist friend, you can find her. Decide again how to split the heritage among the three of you, even though your notary is far from happy with this situation.

To help him solve such problems quickly, your notary would like an automated tool to solve such problems quickly. Impressed with your paedagogical skills and explanations, he proposes you a consulting job to implement an enhanced version of your model that solves these deficiencies. What amount should you bill him (100€ per hour, including all taxes)?