LINGI2365 : Constraint Programming

Assignment 2 :

Modeling

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1 Objective and practical details

The goal of this assignment is for you to explore how to efficiently model more complex Constraint Satisfaction Problems.

You should respect the following constraints

- Deadline : **Friday 9 March 2012 1pm**.
- This assignment is **mandatory**.
- This assignment must be completed **by groups of two** (the same groups as in the previous assignment).

Modalities

- A **hardcopy of your report** must be turned in (box in front of the INGI secretary) before the deadline.
- Deposit your files **code and report pdf** on your repository in the directory `milestone 2` (the SVN server will not accept commit operations after 1pm)
- In case of problems, write to `florence.massen@uclouvain.be`.

2 Problems

2.1 The Social Golfer Problem

The coordinator of the Louvain-la-Neuve golf club has come to you with the following problem:

In the club, there are 32 golfers each of whom play golf once a week, and always in groups of 4. He would like you to come up with a schedule of play for these golfers, to last as many weeks as possible, such that no golfer plays in the same group as any other golfer on more than one occasion.

- Describe different possible models for this problem along with their advantages and disadvantages.
- Does the problem exhibit symmetries? Which ones? Do you consider them in your model? How?
- Indicate the maximum number of weeks you could identify in a reasonable time limit.
- Indicate for each number of weeks the time needed to find a solution, the number of failures and the number of choices.

2.2 The Time Tabling Problem

A set of lectures need to be scheduled in the Ste Barbe rooms. Each lecture will be followed by a number of students and requires different features in the room (e.g. beamer, blackboard, microphone, ...) as well as a sufficient room size. You need to assign each lecture to a room and a time slot.

You are given the following information in the problem instance:

- Number of rooms, features, lectures and students
- For each room the number of students this room can hold
- For each student the set of lectures he has to attend
- For each room the set of features in this room
- For each lecture the set of necessary features

You need to assign a time slot t (out of a total of **45** possible ones) and a room r to each lecture l. For a solution to be feasible the following constraints need to be respected:

- A student can attend only one lecture at any time slot
- A room can hold only one lecture at any time slot
- A lecture can take place only in a room having the required features and big enough to hold all the students that need to attend

You are asked to:

- Describe your model for this problem along with its advantages and disadvantages. Can you think of alternative models?
- Think about symmetries. Does the problem exhibit symmetries? Which ones? Do you consider them in your model? How?
- Test your model on each of the instances provided on the iCampus site. A description of their format is on the iCampus site.
- Indicate for each instance the time needed to solve it, the number of failures and the number of choices.

Hints:

1. To efficiently model this problem you might need to make use of global constraints. A look at the Sport Scheduling example given in the course slides might prove useful.
2. To solve this problem you will need a search procedure that is more efficient than a simple label. You will want to first consider events that have few room and/or time slot options left.
3. Using the previous hint you should be able to find a solution in a few seconds, if this is not the case your model or your search might be too weak.