

Constraint Programming

Practical Exercises

Roman Barták

Department of Theoretical Computer Science and Mathematical Logic

Constraint Modelling

Sky Observatory (by Marika Ivanová)

- Assume a sky observatory with four **telescopes**:
 - Newton, Kepler, Dobson, Monar
- Each day, each telescope can be used by at most one of the following **observers**:
 - scientists, students, visitors, nobody
- Each day, we know the expected **weather**
 - ideal (0), worse (1), no-observations (2)
- and **phases of the moon**
 - 0 (new moon), ..., 4 (full moon), 5, 6.
- The **problem input** is defined by two lists (of equal length) of weather and moon conditions:
 - [1,1,0,0,1,2,1,0],
 - [1,1,2,2,3,3,4,4]



Course requirements

1. **Decide a problem** to be solved and consult its appropriateness with the teacher.
2. **Solve the problem.** The output for course credit consists of
 - **code** in SICStus Prolog with a constraint model
 - example **data**
 - **documentation** with the following sections
 - precise (formal) description of the problem
 - complete abstract description of the constraint model
 - “user manual” – how to run the program
 - results of experiments (different models, different search strategies, different data)

Sky Observatory - restrictions

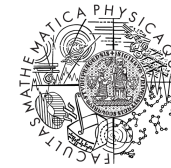
- Newton and Kepler cannot be used together.
- Newton cannot be used by visitors.
- Scientists are never using Monar.
- Dobson cannot be used around full moon (3-5).
- Scientists (students) use at most one telescope each day.
- Students must use at least one telescope during the whole scheduling period.
- When the weather is ideal either students or scientists must use some telescope.



- Using each telescope costs some money (**expenses**), and visitors pay some money (**income**) for using the telescope according to the following table:

	Monar	Dobson	Kepler	Newton
expenses	10	50	60	70
income	20	60	100	100

- In case of bad weather or bad moon conditions (3-5) there is 50% **discount** for visitors when using Monar or Dobson.
- There is some **initial budget** given and the final **balance cannot be negative**.
- Maximize scientific output** of observations (scientists are preferred over students that are preferred over the visitors).



© 2013 Roman Barták

Department of Theoretical Computer Science and Mathematical Logic
bartak@ktiml.mff.cuni.cz