Modelling for Combinatorial Optimisation (1DL451)
Uppsala University – Autumn 2025
Report for the Project by Team t:
Problem

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A Problem

... Reply ...

B Approach

... Reply ...

Our model is given in Listing 1: it has the prescribed comments as per the scope (Topics 1 to 8) of the project, it has the name `project.mzn` and the imposed structure of the provided skeleton model `project-skeleton.mzn`, and it is uploaded to Studium.

Listing 1: A MiniZinc model for ...

```
%% Parameters:
...; % ... meaning ... (for example: X[i,j] = ... i ... j ...)

%% Derived parameters:
...; % ... meaning ... (for example: X[i,j] = ... i ... j ...)
% None

%% Decision variables:
...; % ... meaning ... (for example: X[i,j] = ... i ... j ...)
% Problem constraints enforced by this choice of variables:
% ... paraphrase ...
% No problem constraints are enforced by this choice of variables.

%% Redundant decision variables:
...; % ... meaning ...; (non-)mutually redundant with ...
% None, because ...

%% Channelling constraints:
constraint ...; % 1-way from ... to ... / 2-way between ... and ...
% None, because ...

%% Problem constraints:
```

```
constraint ...; % ... paraphrase ...

%% Implied constraints:
constraint implied_constraint(...); % ... paraphrase ...
% None.

%% Symmetry-breaking constraints:
constraint symmetry_breaking_constraint(...); % ... paraphrase ...
% None.

solve
  %% Search strategy:
  % ... paraphrase ...:
  :: ..._search(...)
  %% Objective and objective function:
  % ... paraphrase ...:
  minimize ... | maximize ... | satisfy;

%% Pretty-print solutions:
output [...];
```

Symmetries. ... problem symmetry ... model symmetry ... value / variable / index / row / column symmetry ... full / partial symmetry ...

Efficiency. ... implied constraints ... symmetry-breaking constraints ... reasoning annotations ... search annotations ...

Checklist. ... Reply (and we understand that we may lose points if there are such model features that we did not detect and discuss) ...

Correctness. ... Reply ...

C Evaluation

All experiments were run under Linux Ubuntu 22.04.5 (64 bit) on an Intel Xeon E5520 of 2.27 GHz, with 4 processors of 4 cores each, with a 70 GiB RAM and an 8 MiB L3 cache (a ThinLinc computer of the IT department).

Table 1 gives our results. The time-out was 6,000,000 milliseconds.

Which backends win overall, and how do you draw that conclusion? ... Reply ...

How do the backends scale, and how do you draw that conclusion? ... Reply ...

Does the difficulty of instances monotonically increase with their size, and how do you draw that conclusion? ... Reply ...

How suitable is local search compared to systematic search, and how do you draw that conclusion? ... Reply ...

Backend	Chuffed		CP-SAT		Gecode		Gurobi		PicatSAT		Yuck	
...	obj	time	obj	time	obj	time	obj	time	obj	time	obj	time
...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1: Results for our approach to Problem, which is a minimisation / maximisation / satisfaction problem. In each `time` column: if the reported time is less than the time-out (6,000,000 milliseconds here), then the objective value in the corresponding `obj` column was *proven* optimal; else the timing out is indicated by `t/o` and the objective value is either the best one found but *not* proven optimal before timing out, or '–' indicating that no feasible solution was found before timing out. Boldface indicates the best performance (time or objective value) on each row.

Are there any contradictions between the results? ... Reply ...

Are there any occurrences of 'ERR' within the results generated by the experiment script? ... Reply ...

Feedback to the Teachers

... Reply ...

Error Report

... Reply ...