University of Basel

Oxiflex - A Constraint Programming Solver for MiniZinc written in Rust

Bachelor's thesis

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Abstract

This thesis discusses the thesis template using some examples of the Turing Machine.

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Constraint Satisfaction Problems

Constraint Satisfaction Problems (CSP) are mathematical questions defined as a finite set of variables whose value must satisfy a number of constraints or limitations. When solely talking about the problem without the algorithmic finding of a solution, these are called Constraint Networks.

Example:

$$w = \{1, 2, 3, 4\}$$
$$y = \{1, 2, 3, 4\}$$
$$x = \{1, 2, 3\}$$
$$z = \{1, 2, 3\}$$

where:

$$w = 2 * x$$
$$w < z$$
$$y > z$$

We define variables w, y, x and z. Variables w and y can both have one value from $\{1, 2, 3, 4\}$ and variables x and z can have a value from $\{1, 2, 3\}$. The constraints then restrict which values are valid from their respective domains. Here $w = 2 \times x$ restrict the value of x to be double of w.

Here we define constraints in a mathmatical notation. There are no formal restrictions on stating constraints, neither by their complexity nor by the number of variables involved. It can be favorable to model constraints as binary constraint sets. Instead of stating the desired relation between variables, we can see that the constraint results in a set of possible value pair tuples. Constraint $w < z$ becomes $(R_{wz} = \{(1, 2), (1, 3), (2, 3)\}$ which contains all possible value pairs for the two varaibles: w and z.

We define Constraint Networks formally:

A (binary) constraint network is a 3-tuple $C =< V, \mathrm{dom}, (R_{uv}) >$ such that:

- V is a non-empty and finite set of variables,
- dom is a function that assigns a non-empty and finite domain to each variable $v \in V$, and
- $(R_{uv})_{u,v \in V, u \neq v}$ is a family of binary relations (constraints) over V where for all $u \neq v : R_{uv} \subseteq \mathrm{dom}(u) \times \mathrm{dom}(v)$

2.1 MiniZinc

MiniZinc [**?**] is a free and open-source constraint modeling language.

2.1.1 FlatZinc

2.2 Queens Problem

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Oxiflex

Introduction to oxiflex.

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A FlatZinc parser for rust.

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Results, Graphs and stuff.

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Time for some interpretation.

A

Appendix

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(including a Declaration on Plagiarism and Fraud)
Translation from German original

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