



CHR (Constraint Handling Rules, *Thom Frühwirth*) is...

- very high level → focus on what, not how (e.g. implicit fixpoint computation)
 - multi-headed rule based → very expressive; declarative reading
 - a language *extension* (embedded in a host language) → no interfacing problems
 - used to write (application tailored) **constraint solvers** → also a general-purpose language
- **Compact programs; easy to understand, modify & experiment with**

Optimizing compilation: Guard Reasoning

Example CHR program: (simple integer interval solver)

```
:- constraints in(?int,+interval).
:- chr_type interval ---> int:int.

X in A:B <=> A>B | fail.
X in A:B <=> A==B | X is A.
X in A:B, X in C:D #C2 <=> A<B, C<D |
    X in max(A,C):min(B,D)
    pragma passive(C2).
```

Example query:

?- V in 2:5, V in 3:7, V in 1:3

↓ rule 3
V in 3:5 , V in 1:3
↓ rule 3
V in 3:3
↓ rule 2

V = 3
Yes

Source to source transformations

Guard Simplification

removes guard conditions that are entailed by the failing of earlier rules

Occurrence Subsumption

if some constraint occurs more than once in a rule head, remove symmetric and other redundant clauses

Compilation to
host language
(Prolog)

Compiled code:

```
X in I :-
    \in/2__0'(X,I,_).
\in/2__0'(_,A:B,T) :-
    A>B, !,
    remove_code
    fail.
\in/2__0'(X,A:B,T) :-
    A==B, !,
    remove_code
    X is A.
\in/2__0'(X,A:B,T) :-
    A<B,
    find_partner(X in C:D)
    C<D, !,
    remove_code
    X in max(A,C):min(B,D).
\in/2__0'(X,C:D,T) :-
    C<D,
    find_partner(X in A:B)
    A<B, !,
    remove_code
    X in max(A,C):min(B,D).
\in/2__0'(X,I,T) :-
    insert_code.
```

Acknowledgements

This research was funded in part by the FWO project G.0144.03 :
“Program Analysis for better memory management and higher performance of HAL, a constraint logic programming language.”

Further information

Jon Sneyers
K.U.Leuven – Dept. Computerwetenschappen
Division of Informatics (DTAI)
Celestijnenlaan 200A
3001 Leuven (Heverlee), Belgium
Jon.Sneyers@cs.kuleuven.ac.be

Supervisor: Bart Demoen

Tel.: +32 16 32 75 44
Fax: +32 16 32 79 96
www.cs.kuleuven.ac.be