

Integrated Logic Systems (Part I)

Prof. Michael Thielscher, Sebastian Voigt

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Exercise 2.1

Consider the special instructions for constants (Slides 2_Prolog2/16-17) and lists (Slide 2_Prolog2/19).

Compile the \mathcal{L}_1 query $? - l([f(a), b|X], c)$ and \mathcal{L}_1 program $l([X, b], c)$. with respect to these instructions and execute the resulting code.

Where is the computed answer substitution (C.A.S.) to be found?

Exercise 2.2

Give the respective sequences of \mathcal{M}_2 instructions (using the optimization for constants) for query $? - diff(X, Y), long(a, Y)$. and program

```
diff(X, Y) :- short(Z, X), long(Z, Y).
short(a, b).
long(a, c).
```

and execute the compiled code.

Exercise 2.3

The goal of this exercise is to extend the WAM such that it is able to handle integer arithmetic with the operations addition, subtraction and multiplication, denoted by the operators $+$, $-$ and $*$, respectively. The operators can be written in infix notation with the usual precedences and are left-associative. For example, $3 * 4 - 2 * 8 + 7$ is interpreted as $((3 * 4) - (2 * 8)) + 7$. The extension of the WAM is supposed to provide the following two predicates:

$:=/2$: $expr_1 := expr_2$ succeeds for two arithmetic expressions $expr_1$ and $expr_2$ iff they can be evaluated to the same integer value

$is/2$: $X is expr$ tries to unify X with the result of evaluating the arithmetic expression $expr$, which succeeds iff X is unbound or a number equal to the evaluated value

- Define a function `evaluate(a:address):integer` which processes the heap representation of a term starting at address `a` and returns its integer value. You may assume functions `+`, `-` and `*` for the addition, subtraction and multiplication of two integer values, respectively.
- Define two new machine instructions `call :=/2` and `call is/2` which realize the predicates as specified above.
- Give the \mathcal{M}_2 code for query $? - X is 3, 8 := 3 + 4 * X - 7$. and trace its execution.