Exercise 1

Integrated Logic Systems (Part I)

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Exercise 1.1

Consider $\mathcal{M}_0$ query term Q:

$$? - legal(player(X), move(Y, Y))$$

and $\mathcal{M}_0$ program term P:

$$legal(X, move(cell(a, Y), cell(a, Y))).$$

a) Give the respective ordered flattened equations for Q and P.

b) Give the respective sequences of $\mathcal{M}_0$ instructions for Q and P.

c) Exectute the compiled code from b). Show also the final state of the HEAP.

d) Where is the computed answer substitution (CAS) to be found?

Exercise 1.2

Consider a more efficent heap representation of L_0 query terms q where subterms of q occurring multiple times are represented only once. For example the query $? - p(a, a)$ shall be represented as

0	STR	1
1	a/0	
2	STR	3
3	p/2	
4	STR	1
5	STR	1

a) Give a translation method for L_0 query terms to WAM_0 instructions which produces this heap representation.

b) Test your translation with the L_0 query terms

$$? - p(f(a), g(f(a))) \text{ and}$$

$$? - p(f(X, g(a)), f(a, g(X)), f(X, g(a))).$$

Exercise 1.3

Give the respective sequences of $\mathcal{M}_0$ instructions for $\mathcal{L}_0$ query term

$$? - \mathit{unify}(h(X, f(a)), h(c, f(b)))$$

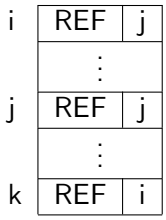
and L_0 program term

$$\mathit{unify}(X, X)$$

and execute the compiled code.

Exercise 1.4

The execution of WAM code may lead to indirections in the heap representation of variable bindings which necessitate the auxiliary function $\mathit{deref}(a : \mathit{adress})$. For example adress k in the following heap structure needs to be dereferenced twice before obtaining an unbound variable cell:



Give an L_0 query term and an L_0 program term such that the execution of the compiled $\mathcal{M}_0$ code produces a heap structure which needs to dereference at least twice when reading the computed answer substition (CAS) for one of the variables of the query term.