Artificial Intelligence Project---RLE and MIT Computation Center

Notes on The Compiler---Memo 7

by J. McCarthy

We will start with a very modest compiler. Our first major goal is a compiler that will compile recursive function definitions. Its input will be LISP statements in restricted notation and its output will be a SAP tape. However we will start with an even simpler compiler that will only compile programs to evaluate expressions and at first we will print these rather than punch them.

The main routine of this preliminary version is compute (L,C). Here L is an expression such that we want a program to evaluate it and C is where the result is to be put. The value of compute (L,C) is a list structure version of the SAP program that performs the computation.

The first thing that compute (L,C) does is branch on car(L). The cases are:

1. car(L)=-1
2. car(L)=car
3. car(L)=cdr
4. car(L)=cons
5. car(L)=eq
6. car(L)=cond
7. car(L)=list
8. other

The programs for some of these cases follow:

1. car(L)=-1 ⟶
   move(L,C)
2. car(L)=car ⟶

```
list(compute(cadr(L),ir4),cla04,move(acan,C))
```

3. car(L)=cdr ⟶

```
list(compute(cadr(L),ir4),cla04,move(acdn,C))
```

4. car(L)=cons ⟶

```
list(compute(cadr(L),corac(cadr(L))),compute(caddr(L),acdc)
    list(inst,std,cadr(L)),list(inst,Z1,Z2Z3),list(inst,
        sxd(11),(inst,ldq,cadr(L)),(inst,cla01),(inst,stq01),
            (inst,pdx01),(inst,lxdt1,4),move(ir4,C))
```

Here Z1,Z2 and Z3 are

```
txl *+3,1,0
srd frout,4
tsx frout+1,4
```

Move (A,B) is a program to move a 15 bit quantity from place A to place B. The possibilities for A and B are

1. acac-address part of accumulation with the rest of the accumulation cleared.
2. acan-address part of accumulation with the rest unspecified.
3. acdc decrement part of ac, rest cleared
4. acdn decrement part of ac, no clearing
5. mqac, mqan, mqdc, mqdn-analogously to above with the mq register instead of the ac.
6. ir4
7. corac (M),coran(M),cordc(M),cordn(M)

Here the destination is a memory register with symbolic address M.

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