PROD1: An example of the PROD Prolog delivery and documentation system

Tim Menzies[1], Sant A. Clause[2]

[1] Lane Department of Computer Science, West Virginia University, PO Box 6109, Morgantown, WV, 26506-6109, USA;
`http://tim.menzies.us`; `tim@menzies.us`
[2] Artic Software Solutions: no ice cube too small, no iceberg too big;
`http://north.pole/~santac`; `santa@north.pole`

Abstract   This document is a minimal example of using the PROD Prolog documentation and delivery system.

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1 Introduction

Here is some explanation text of a Prolog program. This document describes a little SWI-Prolog [6] utility for summing numbers (Prolog is a useful language for rapdily building systems [1–5]). This utility is so small that this level of documentation is clearly ridiculous. However, for larger Prolog programs, this kind of documentation can be very useful.

2 `Sum/2`

`Sum/2` sums a list using tail recursion.

2.1 About Tail Recursion

In tail recursion, the recursive call is the last sub-goal in the body. Tail recursive calls can be optimized as follows. On the stack of current goals, the head goal can be replaced by the tail recursive call (since they both have the same functor and arity). Hence, tail recursive calls don't use the same amount of stack memory as non-tail-recursive calls.

The trick to tail recursion is a *carry variable* that holds the result seen too date.

3 Implementation

First, we need to handle the special case of an empty list.

```
1 sum([],0).
```

In the case of `sum/2`, we initialize this carry variable to the head of the list being summed.

```
2 sum([H|T],S) :- sum(T,H,S).
```

The rest of the implementation just adds the head of the current list to the carry variable, then passes the result to the recursive call.

```
3 sum([],S,S).
4 sum([H|T],In,Out) :- Temp is H + In, sum(T,Temp,Out).
```

4 Demonstrations

To demo the code, we need to:

– Write a demo predicate that shows off our code in action. This is accomplished using the `egsum/0` predicate shown below.
– Trap the output to a file. This is accomplished using the `Demos/1` predicate.
– Include that file in this document. This is accomplished using the following latex magic:

    `\SRC{egsum.spy}{{\tt Sum/2} in action}`

After that include, we can show the output in Figure 1 and reference that figure using

    `\fig{egsum.spy}`

```
───────── egsum.spy ─────────
% output from ':- demos(egsum).'

The sum of [2, 5, 8, 1, 3, 4] is 23.
The sum of [] is 0.
The sum of [2, 10, 7] is 19.
The sum of [3] is 3.

% runtime = 0 sec(s)
```

Fig. 1 `Sum/2` in action

4.1 `Egsum/0`

```
13  egsum :- % see Figure 1
14      Numbers =
15          [[2,5,8,1,3,4]
16          ,[]
17          ,[2,10,7]
18          ,[3]
19          ],
20      forall(member(Nums,Numbers),
21              (sum(Nums,Sum),
22           format('The sum of ~w is ~w.\n',[Nums,Sum]))).
```

4.2 `Demos/1`

`Demos/1` runs a goal `G` and catches the output to the file `G.spy`. Also, just so you know what is going on, it runs the goal `G` a second time and sends the output to the screen.

```
23  demos(G) :-
24      sformat(Out,'~w.spy',G),
25      freshFile(Out),
26      tell(Out),
27      format('% output from '':- demos(~w).''\n\n',G),
28          T1 is cputime,
29      ignore(forall(G,true)),
30      T2 is (cputime - T1),
31      format('\n% runtime = ~w sec(s)\n',[T2]),
32          told,
33      format('% output from '':- demos(~w).''\n',G),
34          ignore(forall(G,true)),
35      format('\n% runtime = ~w sec(s)',[T2]).
```

`Demos/1` needs a helper predicate. `FreshFile/1` makes sure that no one else has scribbled, or is currently scribbling, on our output file.

```
36  freshFile(X) :-
37      (current_stream(X,_,S) -> close(S)        ; true),
38      (exists_file(X)        -> delete_file(X) ; true).
```

4.3 *Using* `Demos/1`.

Next, we need to run the demo code as follows:

```
?- demos(egsum).
```

Once that is done, then when this document will include the output.

5 Conclusion

That's all folks!

References

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Fig. 2 This document is part of the PROD delivery and documentation tool for Prolog applications. To find out more about PROD, the best place to start is memo #2.

work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

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