

Funcons-beta: Lists *

The PLaNCompS Project

Lists.cbs | PLAIN | PRETTY

Lists

```
[ Datatype lists
  Funcon list
  Funcon list-elements
  Funcon list-nil
  Alias nil
  Funcon list-cons
  Alias cons
  Funcon list-head
  Alias head
  Funcon list-tail
  Alias tail
  Funcon list-length
  Funcon list-append ]
```

Meta-variables $T <: \text{values}$

Datatype $\text{lists}(T) ::= \text{list}(_ : (T)^*)$

$\text{lists}(T)$ is the type of possibly-empty finite lists $[V_1, \dots, V_n]$ where $V_1 : T, \dots, V_n : T$.

N.B. $[T]$ is always a single list value, and *not* interpreted as the type $\text{lists}(T)$.

The notation $[V_1, \dots, V_n]$ for $\text{list}(V_1, \dots, V_n)$ is built-in.

Assert $[V^* : \text{values}^*] == \text{list}(V^*)$

Funcon $\text{list-elements}(_ : \text{lists}(T)) : \Rightarrow (T)^*$

Rule $\text{list-elements}(\text{list}(V^* : \text{values}^*)) \rightsquigarrow V^*$

Funcon $\text{list-nil} : \Rightarrow \text{lists}(_)$

$\rightsquigarrow []$

Alias $\text{nil} = \text{list-nil}$

*Suggestions for improvement: plancomps@gmail.com.
Reports of issues: <https://github.com/plancomps/CBS-beta/issues>.

Funcon `list-cons`($_ : T, _ : \text{lists}(T)$) : $\Rightarrow \text{lists}(T)$

Alias `cons` = `list-cons`

Rule `list-cons`($V : \text{values}, [V^* : \text{values}^*]$) $\rightsquigarrow [V, V^*]$

Funcon `list-head`($_ : \text{lists}(T)$) : $\Rightarrow (T)?$

Alias `head` = `list-head`

Rule `list-head` [$V : \text{values}, _^* : \text{values}^*$] $\rightsquigarrow V$

Rule `list-head` [] $\rightsquigarrow ()$

Funcon `list-tail`($_ : \text{lists}(T)$) : $\Rightarrow (\text{lists}(T))?$

Alias `tail` = `list-tail`

Rule `list-tail` [$_ : \text{values}, V^* : \text{values}^*$] $\rightsquigarrow [V^*]$

Rule `list-tail` [] $\rightsquigarrow ()$

Funcon `list-length`($_ : \text{lists}(T)$) : $\Rightarrow \text{natural-numbers}$

Rule `list-length` [$V^* : \text{values}^*$] $\rightsquigarrow \text{length}(V^*)$

Funcon `list-append`($_ : (\text{lists}(T))^*$) : $\Rightarrow \text{lists}(T)$

Rule `list-append`($[V_1^* : \text{values}^*], [V_2^* : \text{values}^*]$) $\rightsquigarrow [V_1^*, V_2^*]$

Rule `list-append`($L_1 : \text{lists}(-), L_2 : \text{lists}(-), L_3 : \text{lists}(-), L^* : (\text{lists}(-))^*$) \rightsquigarrow
`list-append`($L_1, \text{list-append}(L_2, L_3, L^*)$)

Rule `list-append`() $\rightsquigarrow []$

Rule `list-append`($L : \text{lists}(-)$) $\rightsquigarrow L$

Datatypes of infinite and possibly-infinite lists can be specified as algebraic datatypes using abstractions.