

Funcons-beta: Trees *

The PLaNCompS Project

Trees.cbs | PLAIN | PRETTY

Trees

```
[ Datatype trees
  Funcon tree
  Funcon tree-root-value
  Funcon tree-branch-sequence
  Funcon single-branching-sequence
  Funcon forest-root-value-sequence
  Funcon forest-branch-sequence
  Funcon forest-value-sequence ]
```

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

Datatype $\text{trees}(T) ::= \text{tree}(_ : T, _ : (\text{trees}(T))^*)$

$\text{trees}(T)$ consists of finitely-branching trees with elements of type T . When $V : T$, $\text{tree}(V)$ is a leaf, and $\text{tree}(V, B_1, \dots, B_n)$ is a tree with branches B_1, \dots, B_n .

Funcon $\text{tree-root-value}(_ : \text{trees}(T)) : \Rightarrow (T)?$

Rule $\text{tree-root-value } \text{tree}(V : T, _ : (\text{trees}(T))^*) \rightsquigarrow V$

Funcon $\text{tree-branch-sequence}(_ : \text{trees}(T)) : \Rightarrow (\text{trees}(T))^*$

Rule $\text{tree-branch-sequence } \text{tree}(_ : T, B^* : (\text{trees}(T))^*) \rightsquigarrow B^*$

Funcon $\text{single-branching-sequence}(_ : \text{trees}(T)) : \Rightarrow T^+$

$\text{single-branching-sequence } B$ extracts the values in B starting from the root, provided that B is at most single-branching; otherwise it fails.

Rule $\text{single-branching-sequence } \text{tree}(V : T) \rightsquigarrow V$

Rule $\text{single-branching-sequence } \text{tree}(V : T, B : \text{trees}(T)) \rightsquigarrow$
 $\text{left-to-right}(V, \text{single-branching-sequence } B)$

Rule $\text{single-branching-sequence } \text{tree}(_ : T, _ : \text{trees}(T), _ : (\text{trees}(T))^+) \rightsquigarrow \text{fail}$

A sequence of trees corresponds to a forest, and the selector funcons on trees B extend to forests B^* :

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

Funcon forest-root-value-sequence($_ : (\text{trees}(T))^*$) : $\Rightarrow T^*$
Rule forest-root-value-sequence($B : \text{trees}(T), B^* : (\text{trees}(T))^*$) \rightsquigarrow
 (tree-root-value B , forest-root-value-sequence B^*)
Rule forest-root-value-sequence() \rightsquigarrow ()

Funcon forest-branch-sequence($_ : (\text{trees}(T))^*$) : $\Rightarrow T^*$
Rule forest-branch-sequence($B : \text{trees}(T), B^* : (\text{trees}(T))^*$) \rightsquigarrow
 (tree-branch-sequence B , forest-branch-sequence B^*)
Rule forest-branch-sequence() \rightsquigarrow ()

Funcon forest-value-sequence($_ : (\text{trees}(T))^*$) : $\Rightarrow T^*$

forest-value-sequence B^* provides the values from a left-to-right pre-order depth-first traversal.

Rule forest-value-sequence(tree($V : T, B_1^* : (\text{trees}(T))^*$), $B_2^* : (\text{trees}(T))^*$) \rightsquigarrow
 (V , forest-value-sequence B_1^* , forest-value-sequence B_2^*)
Rule forest-value-sequence() \rightsquigarrow ()

Other linearizations of trees can be added: breadth-first, right-to-left, C3, etc.