

Funcons-beta: Trees *

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

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

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

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

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

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

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

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

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

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

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

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