# Semantic tree operations

Let us introduce the *tree tuple* where represents certain node - semantic particle or a subtree.

Here is a tree tuple factor which encodes uniquely the position of the node in the tree.

The following operations are defined for tree tuple factors:

We have a base of tree tuple factors which are defined as distinct strings of fixed number of characters from some alphabet. We have defined an operation which denotes string lexicographic comparison ``, such that . We have an operation `` denoting string concatenation such that:

for any pair

Note that the latter implies that

for any tuple where

Encoding a complete -ary tree of height with the algebraic notation above:

In general we have:

where

Obviously, we have at most distinct terms which represent nodes i.e. semantic values.

The expression for the tree also can be written as:

where