# 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 k1, k2, … km which are defined as distinct strings of fixed number of characters of some chosen alphabet. We have defined an operation which denotes string comparison `<`, such that k1 < k2 < … < km. We have an operation \* denoting string concatenation such that ki \* kj > ki for each i = 1..m.

(ki, (kj, vj)) = (ki\*kj, vj)

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 the nodes i.e. semantic values.

The expression for the tree also can be written as:

where