Abstract

The main concern of this thesis is trees with n internal nodes and m external nodes (leaves) denoted as $\mathcal{T}_{n,m}$. New algorithms for generation, ranking and unranking of these trees in A-order are introduced; So, a new integer sequence codeword, called E-sequence, is presented and shown that A-order over the set of $\mathcal{T}_{n,m}$ matches lexicographic order over the set of corresponding E-sequences.

One important application of trees with n nodes and m leaves is in generating secondary structures of RNAs with $2n + m - 2$ nucleotides and $n - 1$ basepairs.

Time complexity of generation algorithm is $O(n+m)$ whereas the only existing generation algorithm is of $O(nm)$. No other rank nor unrank algorithms are known in the literature.