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A general bijective algorithm for trees. (English)

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Trees are combinatorial structures that arise naturally in diverse applications. They occur in branching decision structures, taxonomy, computer languages, combinatorial optimization, parsing of sentences, and cluster expansions of statistical mechanics. Intuitively, a tree is a collection of branches connected at nodes. Formally, it can be defined as a connected graph without cycles. Schröder trees, introduced in this paper, are a class of trees for which the set of subtrees at any vertex is endowed with the structure of ordered partitions. An ordered partition is a partition of a set in which the blocks are linearly ordered. Labeled rooted trees and labeled planed trees are both special classes of Schröder trees. The main result gives a bijection between Schröder trees and forests of small trees - namely, rooted trees of height one. Using this bijection, it is easy to encode a Schröder tree by a sequence of integers. Several classical algorithms for trees, including a combinatorial proof of the Lagrange inversion formula, are immediate consequences of this bijection.

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