



Hyman Bass, Alexander Lubotzky

Tree Lattices

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[UPDATED 6/6/2000] Group actions on trees furnish a unified geometric way of recasting the chapter of combinatorial group theory dealing with free groups, amalgams, and HNN extensions. Some of the principal examples arise from rank one simple Lie groups over a non-archimedean local field acting on their Bruhat–Tits trees. In particular this leads to a powerful method for studying lattices in such Lie groups. This monograph extends this approach to the more general investigation of X -lattices Γ , where X is a locally finite tree and Γ is a discrete group of automorphisms of X of finite covolume. These "tree lattices" are the main object of study. Special attention is given to both parallels and contrasts with the case of Lie groups. Beyond the Lie group connection, the theory has applications to combinatorics and number theory. The authors present a coherent survey of the results on uniform tree lattices, and a (previously unpublished) development of the theory of non-uniform tree lattices, including some fundamental and recently proved existence theorems. Non-uniform tree lattices are much more complicated than uniform ones; thus a good deal of attention is given to the construction and study of diverse examples. Some interesting new phenomena are observed here which cannot occur in the case of Lie groups. The fundamental technique is the encoding of tree actions in terms of the corresponding quotient "graph of groups." {it Tree Lattices} should be a helpful resource to researchers in the field, and may also be used for a graduate course in geometric group theory.

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