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Semimodular lattices determined by permutations

A finite lattice L is called *slim* if no three join-irreducible elements of L form an antichain. Slim lattices are *planar*. So, they are relatively easy objects to understand. A lattice L is called (upper) *semimodular*, if $b \vee c$ covers or equals $a \vee c$ for all $a, b, c \in L$ such that b covers a. A few years ago, G. Grätzer and J. B. Nation [4] improved the classical Jordan-Hölder theorem for groups. A bit later, noticing that slim semimodular lattices arise naturally as the duals of lattices associated with two composition series of a group, we proved in [2] that the permutation occurring in [4] is uniquely determined.

Following [3] in the talk, we associate a permutation $\pi(D)$ with each planar slim semimodular lattice diagram D. We do this not only as in [2], but also in several different, equivalent ways. The main result is that $\pi(D)$ determines D (up to diagram similarity), whence it also determines the lattice represented by D.

Our description of slim semimodular lattices and their diagrams has some applications, including [1]; these will only briefly mentioned.

References

[1] G. Czédli, L. Ozsvárt, and B. Udvari: How many ways can two composition series intersect? Submitted.

[2] G. Czédli and E.T. Schmidt: The Jordan-Hölder theorem with uniqueness for groups and semimodular lattices. Algebra Universalis, 66 (2011), 69–79.

[3] G. Czédli and E.T. Schmidt: Intersections of composition series in groups and slim semimodular lattices by permutations. Submitted.

[4] G. Grätzer and J. B. Nation: A new look at the Jordan-Hölder theorem for semimodular lattices. Algebra Universalis 64 (2010), 309–311.

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