

STALLINGS AUTOMATA FOR FREE-TIMES-ABELIAN GROUPS: INTERSECTIONS AND INDEX

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*Dedicated to the memory of our late colleague and friend Paul Schupp
(1937–2022)*

Abstract: We extend the classical Stallings theory (describing subgroups of free groups as automata) to direct products of free and abelian groups: after introducing *enriched automata* (i.e., automata with extra abelian labels), we obtain an explicit bijection between subgroups and a certain type of such enriched automata, which—as it happens in the free group—is computable in the finitely generated case.

This approach provides a neat geometric description of (even non-(finitely generated)) intersections of finitely generated subgroups within this non-Howson family. In particular, we give a geometric solution to the subgroup intersection problem and the finite index problem, providing recursive bases and transversals, respectively.

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Key words: free group, free-abelian group, direct product, subgroup, intersection, Stallings, automata.