



Mathematics > Representation Theory

Simplifying and Unifying Bruhat Order for BGB, PGB, KGB, and KGP

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This paper provides a unifying and simplifying approach to Bruhat order in which the usual Bruhat order, parabolic Bruhat order, and Bruhat order for symmetric pairs are shown to have combinatorially analogous and relatively simple descriptions. Such analogies are valuable as they permit the study of PGB and KGB by reducing to BGB rather than by introducing additional machinery. A concise definition for reduced expressions and a simple proof of the exchange condition for PGB are provided as applications of this philosophy. A geometric argument common to all of the cases considered shows that Bruhat order has property Z and therefore satisfies the subexpression property. Thus, Bruhat order can be described using only simple relations, and it is the simple relations which we simplify combinatorially. A parametrization of KGP is a simple consequence of understanding the Bruhat order of KGB restricted to a P-orbit.

Comments: Significant revisions from previous submission, including geometric proofs common to all cases considered that Bruhat order satisfies property Z and the subexpression property

Subjects: **Representation Theory (math.RT)**; Combinatorics (math.CO); Group Theory (math.GR)

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