1067-05-337 **Delong Meng*** (delong13@mit.edu), 290 Massachusetts Ave, Cambridge, MA 02139. *Reduced decompositions and permutation patterns generalized to the higher Bruhat order.*

A reduced decomposition of $w \in S_n$ is an expression of w as a sequence of adjacent transpositions. For example, (12, 13, 23, 14, 24) is a reduced decomposition of 3421 because the squence of transpositions changes 1234 to 3421 as follow:

$$\mathbf{12}34 \to 2\mathbf{13}4 \to \mathbf{23}14 \to 32\mathbf{14} \to 3\mathbf{24}1 \to 3421.$$

The higher Bruhat is a family of posets, one of which is a partial order on the symmetric group. Even though other posets in the higher Bruhat order possess many properties intrinsically similar to the symmetric group, reduced decompositions have never been studied for those posets.

We generalize reduced decompositions to the higher Bruhat order, which in turn shed new light on the reduced decompositions for the symmetric group.

During our study, we introduce generalized permutation patterns into the pictures. Our main result is a geometric representation of reduced decompositions and permutation patterns of the higher Bruhat order as hyperplane arrangements, which yields a generalization of the freely braided permutations studied by Green and Losonczy and the tree graphs of commutation classes studied by Bridget Eileen Tenner. (Received August 24, 2010)