Pentagram maps and refactorization in Poisson-Lie groups

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The pentagram map was introduced by Richard Schwartz in 1992, and is now one of the most renowned discrete integrable systems which has deep connections with many different subjects such as integrable PDEs, cluster algebras, dimer models etc. The definition of the pentagram map is illustrated in Figure 1: the image of the polygon P under the pentagram map is the polygon P' whose vertices are the intersection points of consecutive "short" diagonals of P (i.e., diagonals connecting second-nearest vertices).

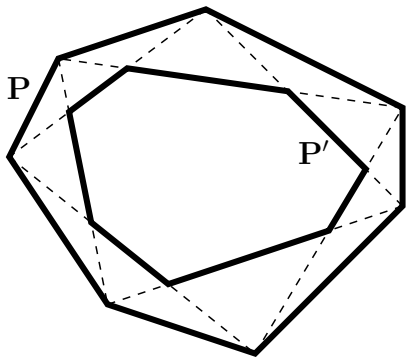

Figure 1: The pentagram map.

In this talk I will present a geometric construction which identifies the pentagram map, as well as its various multidimensional generalizations, with refactorization-type mappings in Poisson-Lie groups. This provides invariant Poisson structures and commuting first integrals for all these maps.