Simion's type B associahedron is a pulling triangulation of the Legendre polytope

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Preprint no. 2016-08

Abstract

We show that Simion's type B associahedron is combinatorially equivalent to a pulling triangulation of a type B root polytope called the Legendre polytope. Furthermore, we show that every pulling triangulation of the Legendre polytope yields a flag complex. Our triangulation refines a decomposition of the Legendre polytope given by Cho. We extend Cho's cyclic group action to the triangulation in such a way that it corresponds to rotating centrally symmetric triangulations of a regular $(2n + 2)$-gon. Finally, we present a bijection between the faces of the Simion's type B associahedron and Delannoy paths.

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