

Three faces of mitosis: types A , B/C and D

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Abstract. Mitosis was first devised in type A by Allen Knutson and Ezra Miller in the context of Schubert polynomials and pipe dreams. The notion of pipe dreams can be extended to other classical types using Kogan faces of Gelfand-Zetlin polytopes. In this context, mitosis can be viewed as a convex geometric incarnation of divided difference and Demazure operators from Schubert calculus and representation theory. We will discuss mitosis and its applications in all types including the recent results of Ekaterina Nistyuk (née Presnova) in type D . All necessary definitions will be given in the talk.

Introduction

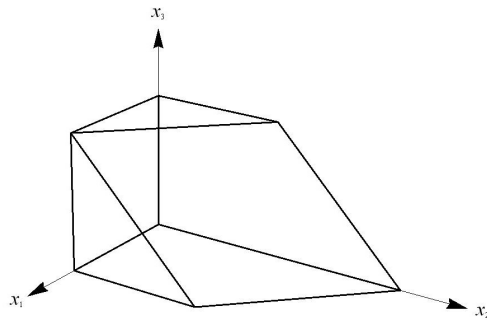
Mitosis as a mathematical notion was introduced by Knutson and Miller to generate combinatorial objects, called reduced pipe dreams or rc-graphs, from a single object. Originally, pipe dreams were used to enumerate the coefficients of Schubert polynomials in the type A . Recall that Schubert polynomials are defined inductively by applying divided difference operators to a single Schubert polynomial. Hence, mitosis operations can be thought of as combinatorial counterparts of divided difference operators from Schubert calculus.

We define a convex geometric version of mitosis. It can be applied to Gelfand–Zetlin polytopes in the classical types and other string polytopes. In types A and B/C , this construction yields already known mitosis algorithms of Knutson–Miller and Fujita, respectively. In type D , we get a new construction of mitosis on pipe dreams and reduced subwords.

1. Tables and Figures

References

- [1] Valentina Kiritchenko, *Simple geometric mitosis*. J. of Comb. Theory, Series A **213** (2025), Article 106002

FIGURE 1. Gelfand–Zetlin polytope in type A_2

- [2] Ekaterina Presnova, *Gelfand–Zetlin polytopes in the type D* , Master Thesis, HSE University, 2025

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