Airports: a link between Schubert calculus and Macdonald polynomials

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Abstract

Modern Schubert calculus is an approach to questions in enumerative geometry which uses algebraic geometry and topology to convert problems into computations with explicit representatives the (quantum) cohomology ring of a variety. Macdonald polynomials are a basis of the symmetric functions over $\mathbb{Q}[q,t]$ whose coefficients record the bigraded degrees of irreducible submodules of an S_n-module and have applications to mathematics, computer science, and physics. We have found a combinatorial object which we call an *airport* that provides a link between these two fields. These airports allow for natural descriptions of Macdonald polynomials and other important polynomials in a similar language to Lascoux and Schützenberger's expansion of the Hall-Littlewood polynomials by defining a new *skip* statistic. This gives a framework to apply results from one area to the other.