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A q-weighted version of the Robinson-Schensted algorithm. (English) Zbl 1278.05243

Electron. J. Probab. 18, Paper No. 95, 25 p. (2013).

Summary: We introduce a q-weighted version of the Robinson-Schensted (column insertion) algorithm which is closely connected to q Whittaker functions (or Macdonald polynomials with $t = 0$) and reduces to the usual Robinson-Schensted algorithm when $q = 0$. The q-insertion algorithm is 'randomised', or 'quantum', in the sense that when inserting a positive integer into a tableau, the output is a distribution of weights on a particular set of tableaux which includes the output which would have been obtained via the usual column insertion algorithm. There is also a notion of recording tableau in this setting.

We show that the distribution of weights of the pair of tableaux obtained when one applies the q-insertion algorithm to a random word or permutation takes a particularly simple form and is closely related to q-Whittaker functions. In the case $0 \leq q < 1$, the q-insertion algorithm applied to a random word also provides a new framework for solving the q-TASEP interacting particle system introduced (in the language of q-bosons) by *T. Sasamoto* and *M. Wadati* [J. Phys. A, Math. Gen. 31, No. 28, 6057–6071 (1998; Zbl 1085.83501)] and yields formulas which are equivalent to some of those recently obtained by *A. Borodin* and *I. Corwin* ["Macdonald processes", Probab. Theory Relat. Fields (to appear)] via a stochastic evolution on discrete Gelfand-Tsetlin patterns (or semistandard tableaux) which is coupled to the q-TASEP. We show that the sequence of P-tableaux obtained when one applies the q-insertion algorithm to a random word defines another, quite different, evolution on semistandard tableaux which is also coupled to the q-TASEP.

MSC:

05E05	Symmetric functions and generalizations	Cited in **2** Reviews
15B52	Random matrices (algebraic aspects)	Cited in **11** Documents
82C22	Interacting particle systems in time-dependent statistical mechanics	

Keywords:

q-Whittaker functions; Macdonald polynomials

Full Text: DOI arXiv