

Canopy of binary trees and asymmetric exclusion process

Xavier Gérard Viennot

`viennot@labri.fr`

LaBRI

Université Bordeaux 1

351 cours de la Libération

F-33405 Gradignan CEDEX

FRANCE

Abstract

The totally asymmetric exclusion process (TASEP) is a very rich and well studied 1D gas model in statistical mechanics of non-equilibrium systems. Explicit expressions for the stationary probabilities have been given by the physicists Derrida, Evans, Hakim and Pasquier using a “matrix ansatz”. In recent years, many works have been done for a pure combinatorial understanding of that model by Duchi, Schaeffer, Brak, Essam, Corteel, Parviainen, Rechnitzer and Williams, following the pioneer paper of Shapiro and Zeilberger. In this talk, I will continue such combinatorial understanding, using binary trees and the non-classical notion of canopy, analog for binary trees of classical up-down sequence for permutations. The basis of this study is a bijection between binary trees and the so-called “Catalan tableaux”. Such tableaux are “permutations tableaux” (introduced by Steingrimsson and Williams, in the continuation of Postnikov’s work about totally non negative Grassmannians) having only one “1” in each column of the underlying Ferrers diagram. We deduce and relate bijectively the interpretations of the stationary probabilities by Duchi-Schaeffer (in terms of pairs of lattice paths), by Corteel-Williams (in terms of tableaux) to the one presented here in terms of weighted binary trees.