# Fluctuations for one-dimensional Brownian motions with oblique reflection

T. Sasamoto, Chiba University

We consider a system of Brownian motions in one-dimension in which the $j$th particle is reflected by the $(j+1)$th particle with weight $p$ and also by the $(j-1)$th particle with weight $q$, where $j \in \mathbb{N}$ and $p \geq 0, q \geq 0, p+q=1$. More precisely, for the case with $m$ particles, we consider $y(t) = (y_1(t), \ldots, y_m(t))$ with $y_1(t) \leq \ldots \leq y_m(t)$ which satisfies

$$y_j(t) = y_j + B_j(t) - p\Lambda^{(j,j+1)}(t) + q\Lambda^{(j-1,j)}(t) \tag{0.1}$$

where $\Lambda^{(0,1)}(t) = \Lambda^{(m,m+1)}(t) = 0$ and

$$\Lambda^{(j,j+1)}(\cdot) = L^{y_{j+1}-y_j}(\cdot, 0) \tag{0.2}$$

is the local time for $y_{j+1}(\cdot) - y_j(\cdot)$. The system with a symmetric ($p = q = 1/2$) reflection, corresponding to independent Brownian motions with ordering maintained, was introduced by Harris in 1965 and has been studied by many authors since then.

In the totally asymmetric ($q = 1$) case, a particle with smaller index has a priority to the one with a larger index; the latter is simply reflected by the former. The finite particle system for this special case was discussed by Warren and others. More recently, there have been some progress for more general initial conditions by by Ferrai, Spohn and Weiss.

In this presentation we consider generic asymmetric case where $0 < p < q < 1$. The large time properties are expected to be similar to the totally asymmetric case, i.e., to belong to the KPZ universality class. But the techniques for the totally asymmetric case do not work for the general case. Our analysis is based on a duality (in fact a self-duality) property for the process, which allows us to obtain a few formulas for quantities related to current and discuss the asymptotics. A similar analysis has been done for the case of the asymmetric simple exclusion process(ASEP) in [BCS]. The main purpose of the presentation is to explain the applicability of the methods to the Brownian motion case and demonstrate its usefulness.

The presentation is based on a collaboration with H. Spohn.

[BCS] A. Borodin, I. Corwin, T. Sasamoto, From duality to determinants for q-TASEP and ASEP, arXiv:1207.5035, to appear in Ann. Prob.