The Hydrodynamic limit and Propagation of Chaos for Brownian Particles Reflecting from an Inert Barrier

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Consider a finite collection of Brownian particles of equal mass reflecting from one side of a moving barrier, and pushing this barrier away by giving it a velocity proportional to the accumulated local time of collision. This is a multi-particle analog of a process constructed by Knight (2001). We find the hydrodynamic limit as the number of particles goes to infinity, and prove the propagation of chaos. The stochastic tools developed allow us to prove existence and uniqueness for a class of free boundary problems.