

# Complex martingales and determinantal processes

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Appearance of determinantal (free fermion) structures in the asymptotic solutions of the KPZ equation, the ASEP, and other related systems is remarkable, since these systems are not determinantal in general. In the present talk, a new point of view for determinantal processes is discussed using a notion called martingale used in probability theory. Martingales are the stochastic processes preserving their mean values and thus they represent intrinsic fluctuations involved in the system. In order to derive determinantal structures in the 1+1 dimensional spatio-temporal plane, we consider systems of martingales defined on a complex plane. These complex martingales in the 2+1 dimensions are obtained by conformal maps of a simple martingale process like a complex Brownian motion. By averaging over imaginary components, we obtain the physical determinantal processes in the 1+1 dimensions studied in random matrix theory and in the recent research on the KPZ universality class.