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REPULSIVE JUMPS WITH FREE COALESCENCE IN CONTINUUM: THE MICROSCOPIC DESCRIPTION

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ABSTRACT

The evolution of states of an individual-based model of freely coalescing and repulsively jumping entities is discussed. The phase space of the model is the space Γ of locally finite configurations on R^d. It is equipped with measurable structure, which allows to consider probability measures on Γ. Such measures are considered as states of the system. Similar models of single-type population are used to describe predation in ecology (*e.g.*, for marine ecosystems).

The model discussed here is a special case of the one introduced in [1], where the act of coalescence (merging) was influenced by neighbourhood of coalescing entities. It caused some difficulties in an attempt to rigorously describe the microscopic evolution. In the present model coalescence is free, that is influenced only by the location of coalescing entities. It allows one to overcome mentioned difficulties and construct the evolution of states. Both models can be considered as an extension of the Kawasaki Dynamics described, *e.g.*, in [2], where the model of repulsively jumping entities was considered, without coalescence.

The dynamics of the system is obtained using so-called statistical approach. The model is specified by a Markov 'generator' L, acting on observables, *i.e.*, appropriate functions $F : \Gamma \to R$. The generator enters the Kolmogorov equation $\frac{d}{dt}F_t = LF_t$. The evolution of states is described by the corresponding Fokker-Planck equation.

However, as number of entities belonging to configurations is not restricted to be finite, it is not possible to solve the above equations directly. To bypass this difficulty, the initial state is restricted to the set of sub-Poissonian states and passage to corresponding problem for correlation (or moment) functions is performed. The existence and uniqueness of solution of this problem is obtained using the Ovcyannikov's method. The identification of the constructed solution with the unique state is performed. It is obtained with the help of an auxiliary model which was inspired by the one used in [3] for a similar purpose.

REFERENCES

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