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Evolution of infinite populations of immigrants: micro- and mesoscopic description

Abstract

A model is proposed of an infinite population of entities immigrating to a noncompact habitat, in which the newcomers are repelled by the already existing population. The evolution of such a population is described at micro- and mesoscopic levels. Themicroscopic states are probability measures on the corresponding configuration space. States of populations without interactions are Poisson measures, fully characterized by their densities. The evolution of micro-states is Markovian and obtained from the Kolmogorov equation with the use of correlation functions. The mesoscopic description is made by a kinetic equation for the densities. We show that the micro-states are approximated by the Poissonian states characterized by the densities obtained from the kinetic equation. Both micro- and mesoscopic descriptions are performed and their interrelations are analyzed, that includes also discussing the problem of the appearance of a spatial diversity in such populations.