FUNCTIONAL CENTRAL LIMIT THEOREM FOR SPATIAL BIRTH AND DEATH PROCESSES

Xin QI *Beijing University, P. R. China*, E-mail: xinqi@math.pku.edu.cn

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Abstract: For any bounded and integrable function in Euclidean space (with respect to Lebesgue measure), we define a family of processes which is obtained by integrals of the function with respect to the centered and scaled spatial birth and death process with constant death rate. We give conditions on the birth rate such that this family converges weakly to some Gaussian process. By Mitoma (1983), under an appropriate topology, the centered and scaled spatial birth and death process will converge weakly to a distribution-valued process. We also give the same result for spatial pure birth processes with constant death rate and apply our theorem to random packing problem obtaining the results of Penrose and Yukich (2002). In order to show the convergence of the finite-dimensional distributions of the above processes, we extend the multivariate spatial central limit theorem in Penrose (2005) to a more general case. Then we apply the extended theorem to the stochastic equations for spatial birth and death processes in Garcia and Kurtz (2006).