

Fluid approximation of birth-and-death processes
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It is known that (normalized) trajectories ${}^n Y_t/n$ of a birth-and-death continuous-time process converge (as $n \rightarrow \infty$) to a deterministic curve z_t if ${}^n Y_0 = z_0 \cdot n$ and the birth and death parameters increase linearly with n . The proofs are based on the Law of Large Numbers. In case one is interested only in functional $E \left[\int g({}^n Y_s/n) ds \right]$ converging to $\int z_s ds$, another approach seems to be more straightforward, which is based on the integral representation of suchlike functionals.

I shall consider in detail the simplest case of the process absorbing at zero. After that, I shall describe models originated from the analysis of Internet routers and fix more challenging problems for the future investigation.

Main question under study: How accurate is the fluid approximation?