

Open Markov type population models: from discrete to continuous time

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We address the problem of finding a natural continuous time Markov type process in open populations — that best captures the information provided by an open Markov chain in discrete time which is usually the sole possible observation from data. Given the open discrete time Markov chain, we single out two main approaches. In the first one, we consider a calibration procedure of a continuous time Markov process using a transition matrix of a discrete time Markov chain and we show that, when the discrete time transition matrix is embeddable in a continuous time one, the calibration problem has optimal solutions. In the second approach we consider semi Markov processes — and open Markov schemes — and we propose a direct extension from the discrete time theory to the continuous time one by using a known structure representation result for semi Markov processes that decomposes the process as a sum of terms given by the products of the random variables of a discrete time Markov chain by time functions built from an adequate increasing sequence of stopping times.

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