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From discrete to continuum models of a multi-cellular system

Abstract

The scale on which a given biological problem is mathematically defined depends on a range of factors (e.g. availability of experimental data and computational tools, preferences of the modeller etc.). Historically, multi-cellular systems were described using continuum models. Amongst the advantages of this approach is the availability of existing mathematical tools that allow one to analyse models and gain qualitative insights from the solutions. More recently, discrete cell-based models have been used to study multicellular systems. Amongst their advantages are that they are conceptually easy to communicate and can naturally accommodate features such as heterogeneity and stochasticity. As these (typically N -body) problems are solved using brute force approaches, it can be difficult to gain qualitative insight from the computed solutions.