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Analysis of macroscopic behaviour in complex particle systems

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Complex particle systems are, due to their many degrees of freedom difficult to analyze with standard methods, but often do not contain enough particles to perform a limit to a continuum description. It will be shown how the collective behaviour of these type of systems can be analyzed by so-called equation-free methods. These allow one to perform numerical investigations of the collective behaviour for which no explicit equations are available. This includes continuation and bifurcation analysis of the collective behaviour depending on system parameters. The methods are motivated and demonstrated with models and experiments from car and pedestrian traffic.