

# Inferring Dependency Graphs for Agent-Based Models using Aspect-Oriented Programming

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## **Abstract**

Agent-based models (ABMs) have become a popular approach in many domains of modelling and simulation. Recent works proposed that some of those models might be mapped to a Continuous-Time Markov Chain and simulated using a Stochastic Simulation Algorithm (SSA). It was however found that, especially in the case of ABM, the original SSA is rather inefficient: it does not exploit the locality of the agents' actions. SSAs that do, require information about inter-agent dependencies. One way to provide such information to the SSA is by explicitly encoding it in the model, which contradicts the separation of concerns. The goal of this thesis is to use aspect-oriented programming to automatically retrieve those dependencies without the need to encode information in the model. A concept for aspect-oriented SSAs is provided, which can be integrated with existing ABM frameworks that are based on a general purpose language. As a proof of concept, the integration is performed as an extension to the MASON framework. Further, its performance is characterised and the range of applicability is discussed.