

ABSTRACTIONS OF STOCHASTIC PROCESS ALGEBRAS

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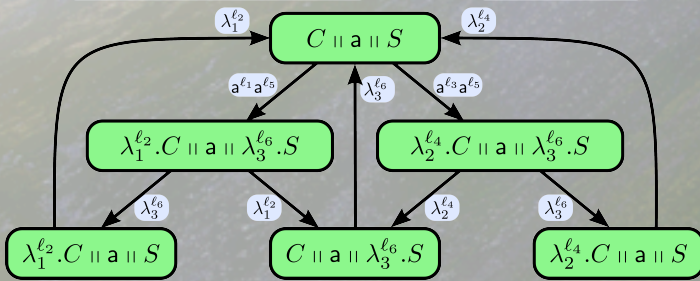
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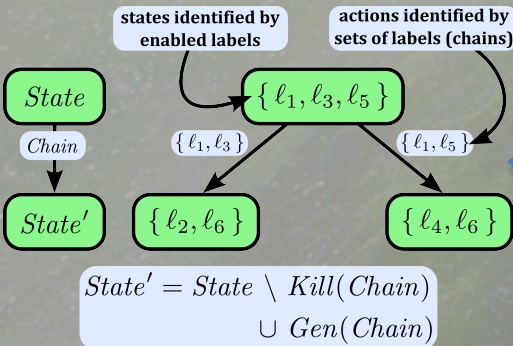
Stochastic process algebras are compositional languages that are used to model systems that evolve probabilistically over time. **IMC** and **PEPA** are two examples, which make different decisions about how components interact. Both have a semantics that maps a model into a Markovian formalism, and suffer from the state space explosion problem. This poster is about two techniques for reducing the size of the underlying model, without having to construct its entire state space: **pathway analysis**, and **compositional abstraction**.

Interactive Markov Chains (IMC)

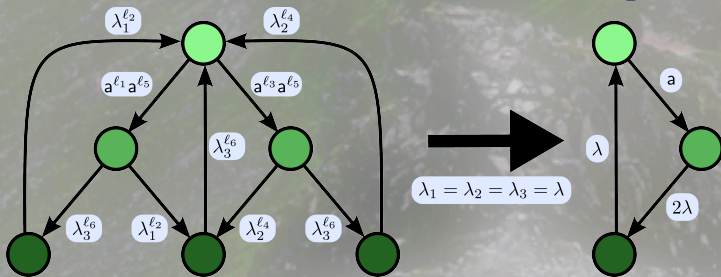
$$C := a^{\ell_1}.\lambda_1^{\ell_2}.C + a^{\ell_3}.\lambda_2^{\ell_4}.C \quad S := a^{\ell_5}.\lambda_3^{\ell_6}.S$$



Static Analysis of IMC: Pathway Analysis

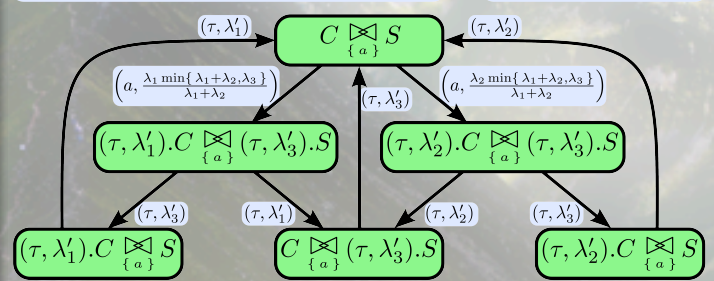


Bisimulation-Minimisation of the Example

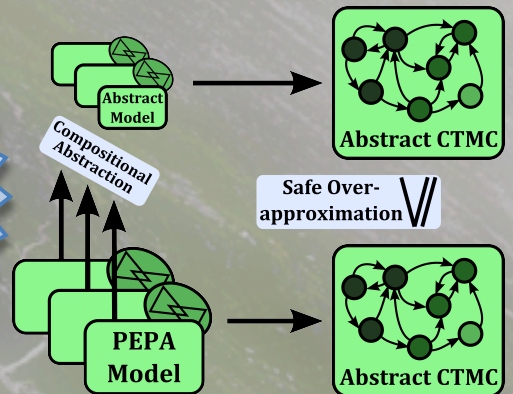


Performance Evaluation Process Algebra (PEPA)

$$C \stackrel{def}{=} (a, \lambda_1).(\tau, \lambda'_1).C + (a, \lambda_2).(\tau, \lambda'_2).C \quad S \stackrel{def}{=} (a, \lambda_3).(\tau, \lambda'_3).S$$



Compositional Abstraction of PEPA Models



Model

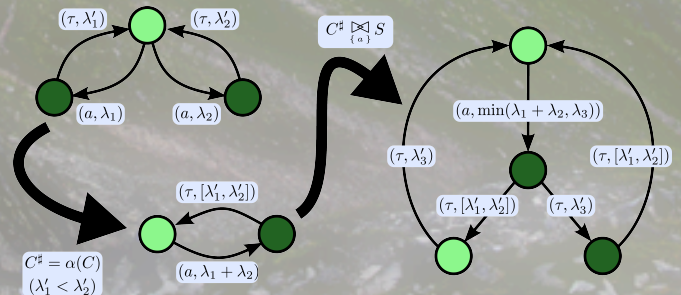
Static Analysis

Bisimulation-minimisation without constructing state space

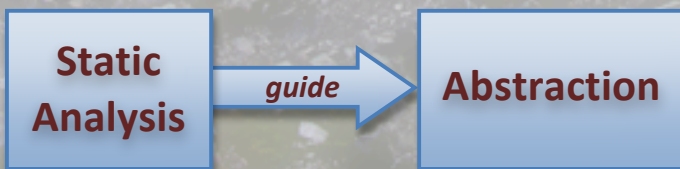
Abstraction

CSL model checking of abstract Markov chain

Compositional Abstraction of the Example



Future Work: Combining the Techniques



References

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- [4] M.J.A. Smith. Abstraction and model checking in the PEPA plug-in for Eclipse. To appear in QEST '10: Quantitative Evaluation of Systems. 2010.