

Performance Modelling — Lecture 12(ish) PEPA Exercises

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A basic PEPA model

Consider the web service previous modelled with GSPN:

A third party app receives requests from users for live bus positioning information. It sends requests to the the Google Map API and the TfE Bus Info API and then aggregates the results to present a map view of the bus data which is returned to the user.

Construct a PEPA model to represent this system.

Derivative graph

Consider the following PEPA model:

$$P \stackrel{\text{def}}{=} (\text{task1}, r_1).P' + (\text{task2}, r_2).P'$$

$$P' \stackrel{\text{def}}{=} (\text{reset}, s).P$$

$$Q \stackrel{\text{def}}{=} (\text{task1}, \top).Q'$$

$$Q' \stackrel{\text{def}}{=} (\text{log}, t).Q$$

$$\text{Sys} \stackrel{\text{def}}{=} P \boxtimes_{\{\text{task1}\}} Q$$

- 1 Construct the derivative graph or labelled transition system corresponding to this model.
- 2 Construct the infinitesimal generator matrix for the CTMC underlying this model.

Multiway synchronisation

The cooperation sets can make a big difference in the behaviour. Consider the three PEPA models below and explain who will participate in α activities when they occur:

- $((\alpha, r).P \underset{\{\alpha\}}{\boxtimes} (\alpha, s).Q) \underset{\{\alpha\}}{\boxtimes} (\alpha, t).R$
- $((\alpha, r).P \parallel (\alpha, s).Q) \underset{\{\alpha\}}{\boxtimes} (\alpha, t).R$
- $((\alpha, r).P \underset{\{\alpha\}}{\boxtimes} (\alpha, s).Q) \parallel (\alpha, t).R$

Rates of cooperation

Consider the PEPA process below:

$$((\alpha, 4r).A \boxtimes_{\{\alpha\}} (\alpha, r).B) \boxtimes_{\{\alpha\}} ((\alpha, r).C + (\alpha, r).D)$$

What is the apparent rate of α in the process shown above?
Explain your reasoning.