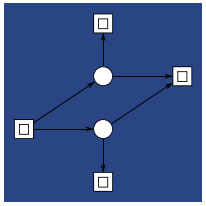

Brandenburg
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Colored Petri Nets for Modeling and Analyzing Biological Systems

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Brandenburg University of Technology Cottbus

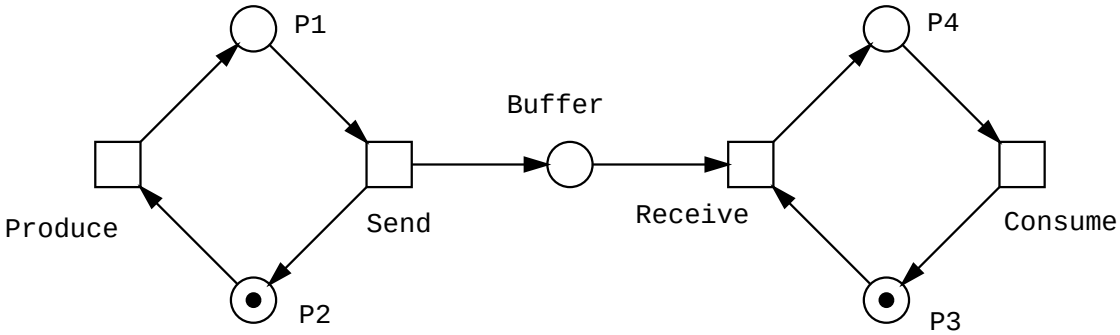
Dagstuhl Seminar
April 10 2011

Outline

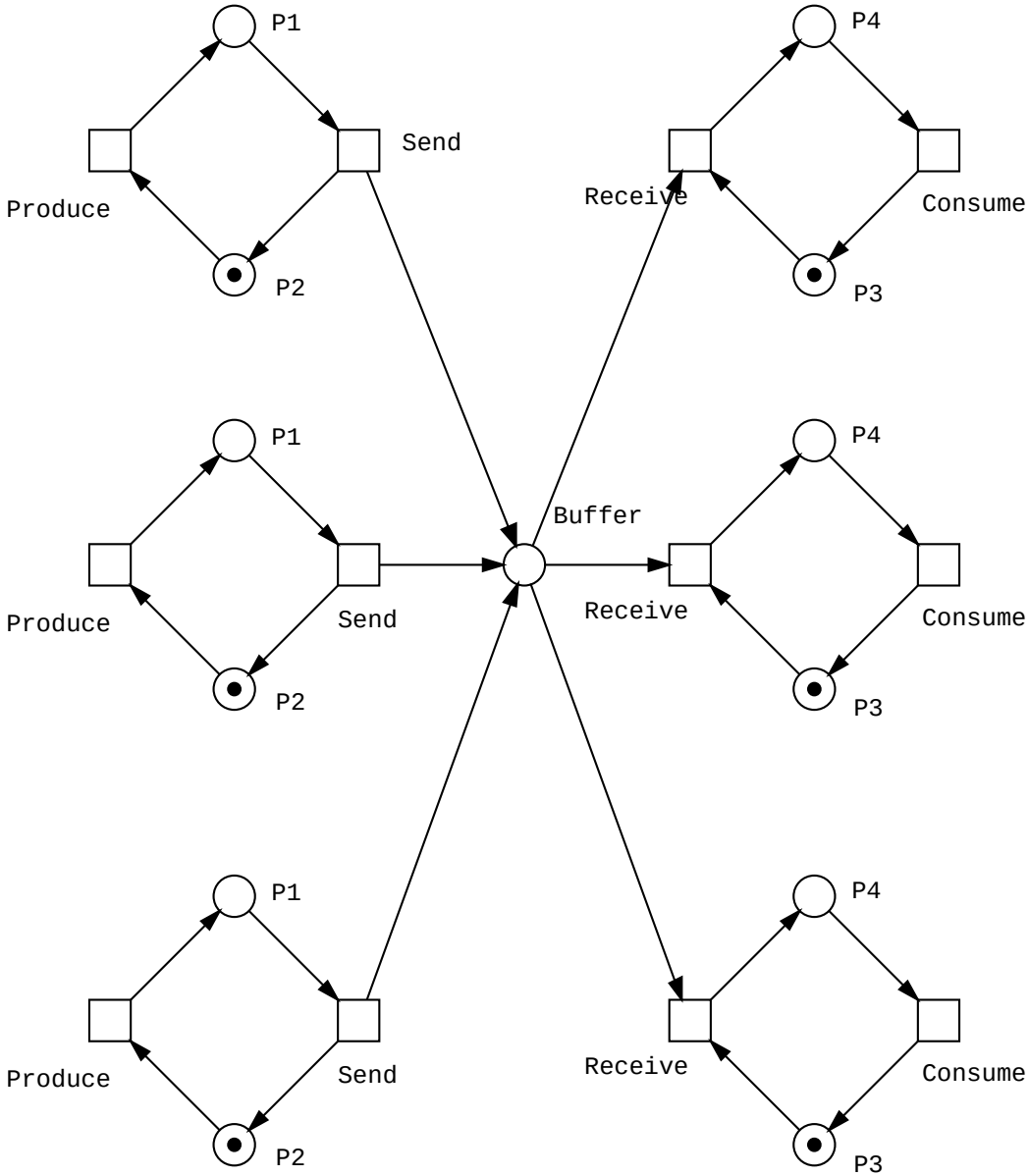
- Motivation
- Snoopy

Motivation

Producer-Consumer



Producer-Consumer



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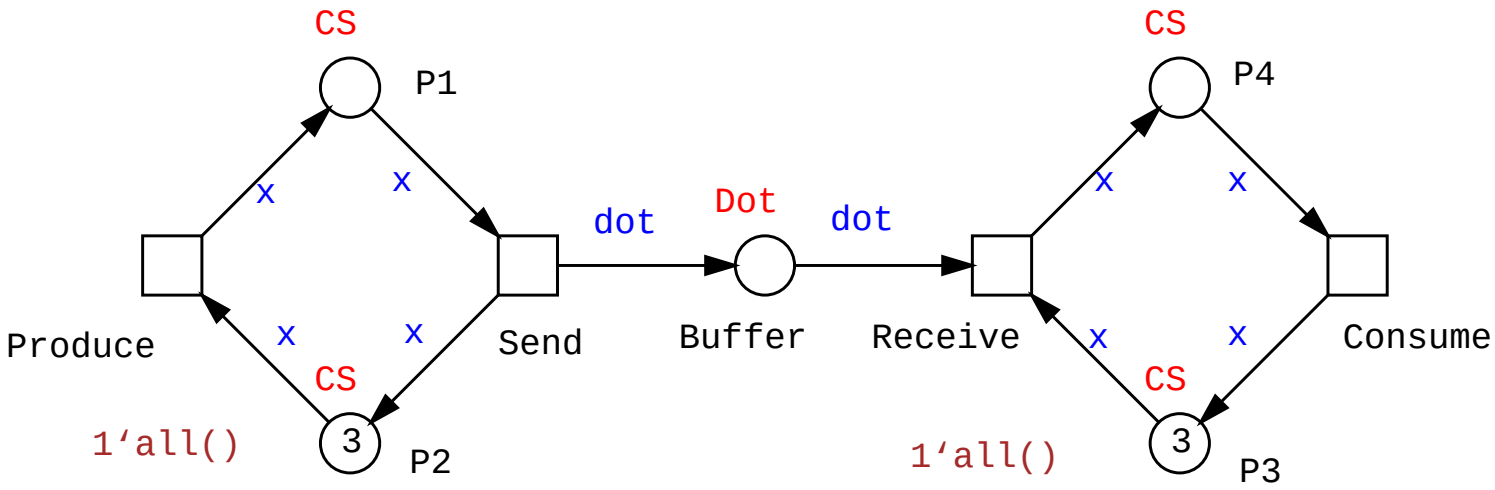

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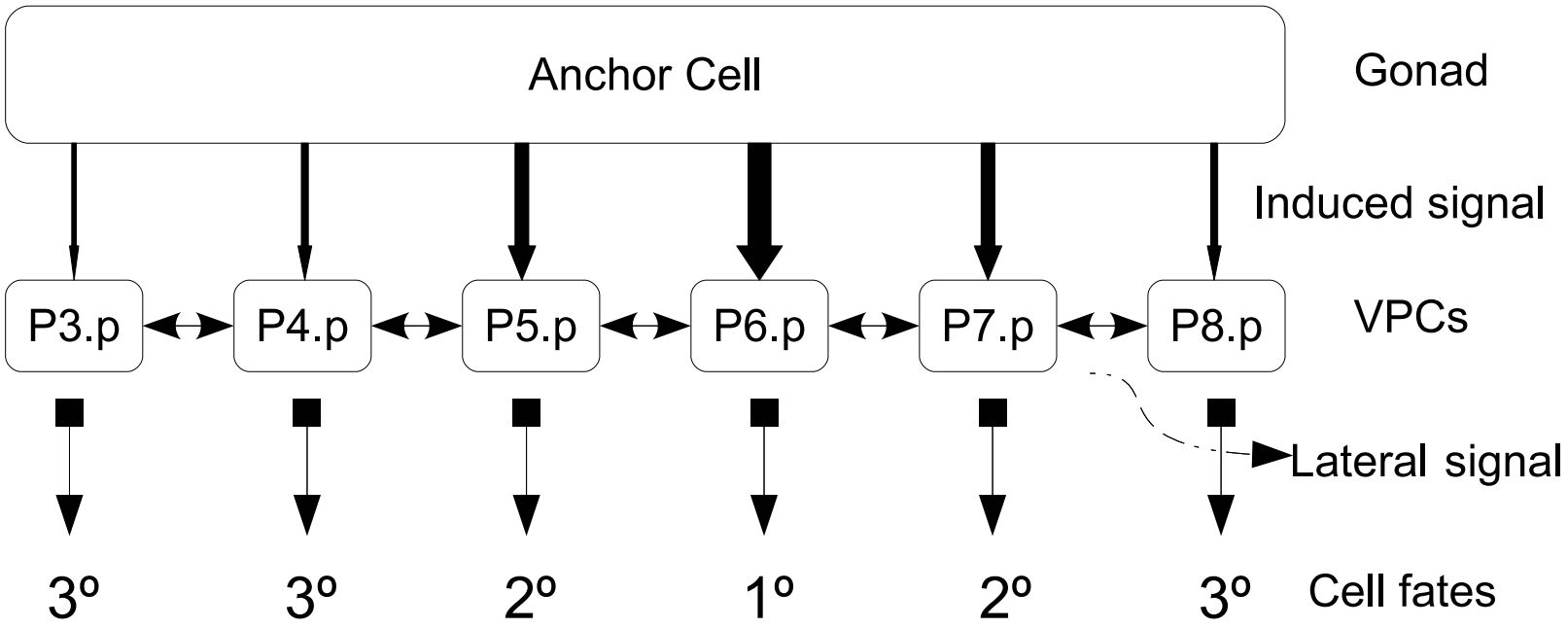
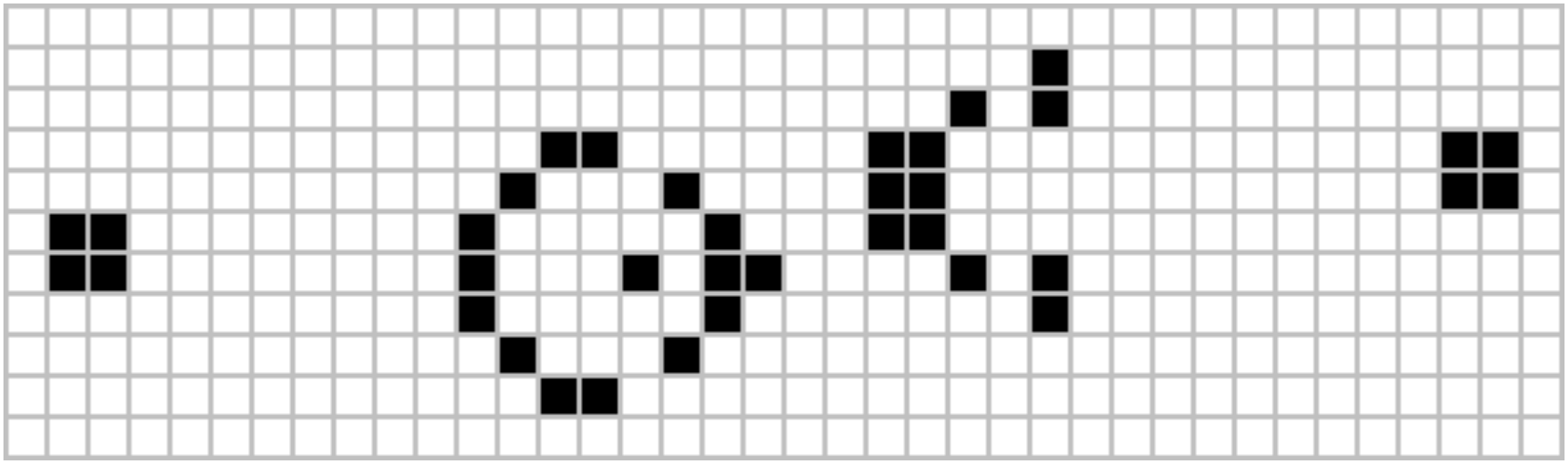
  - transducers
- biological systems with spatial aspects
  - grid-based agent systems
  - membrane systems

Example: C. elegans



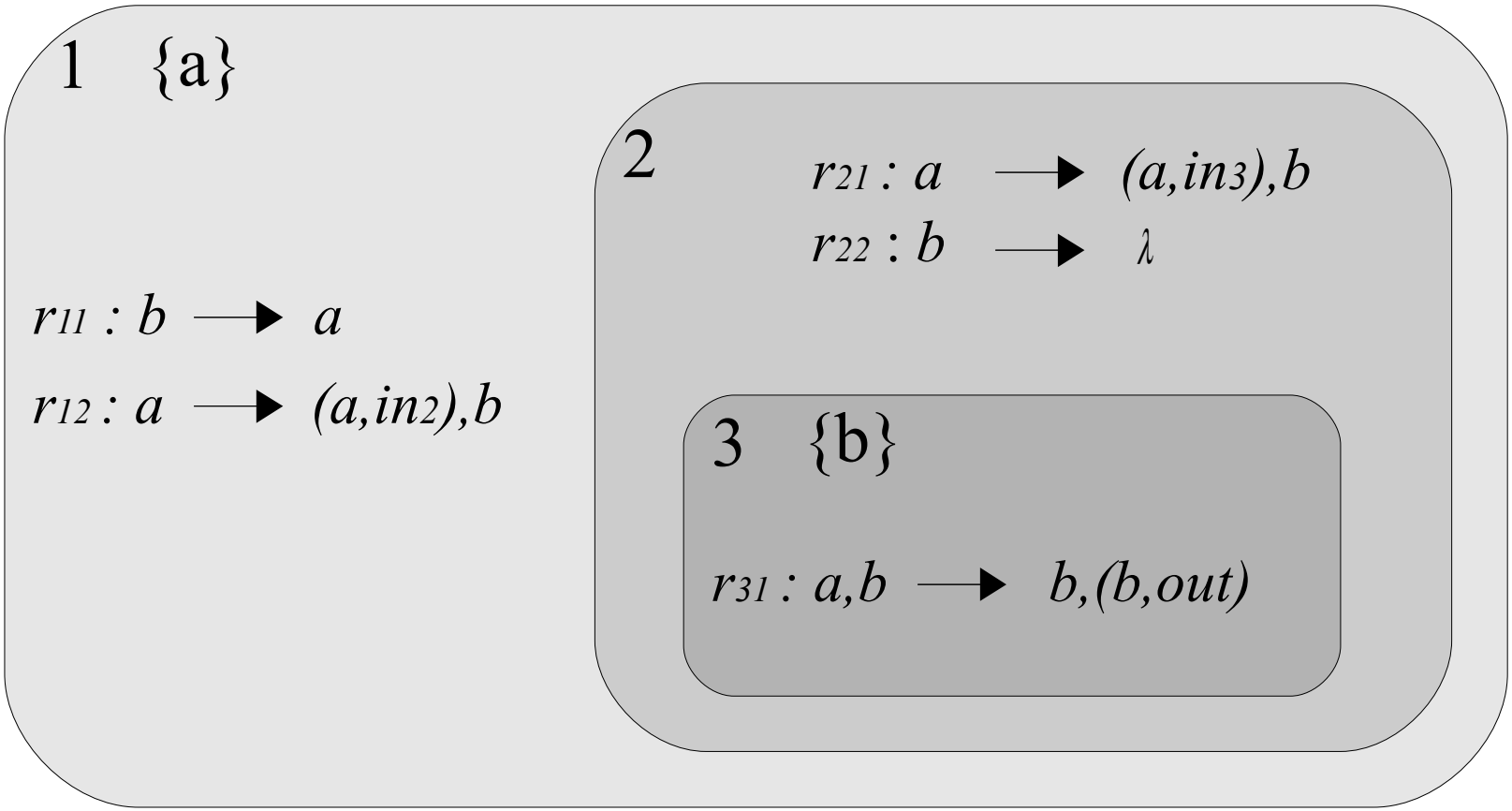
- Colset CS = integer with 3-8;

Example: agent-based models with a grid



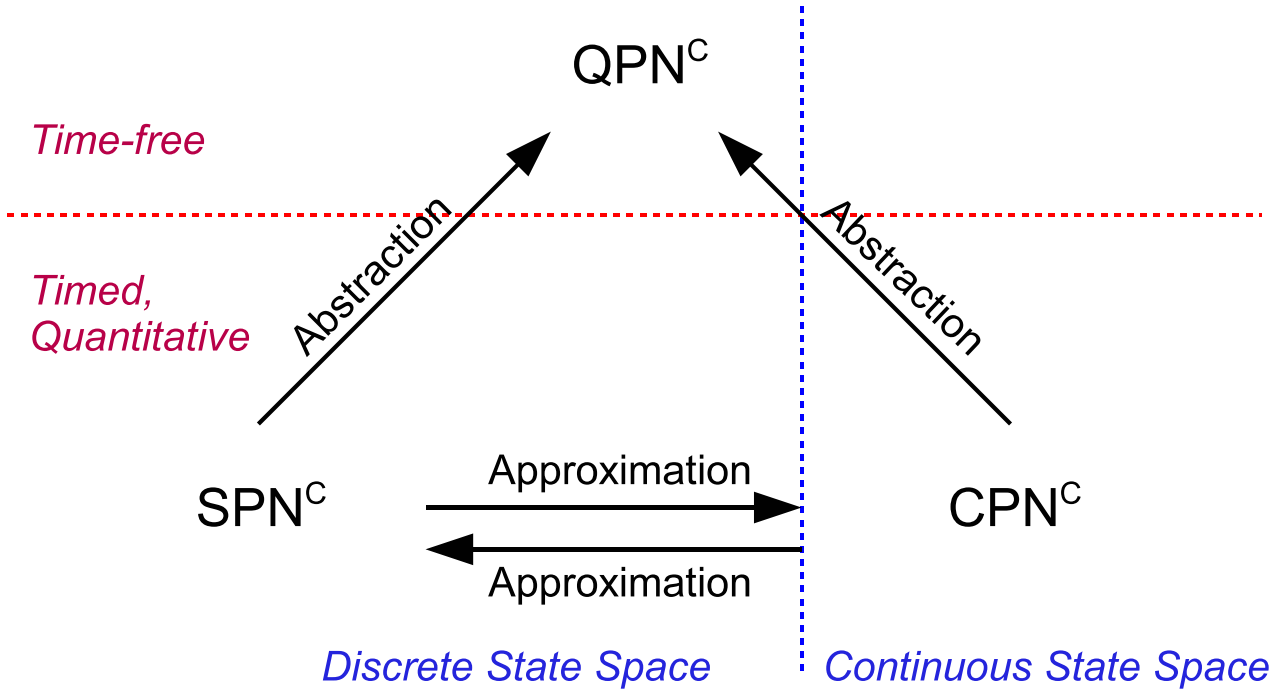
Ref: http://en.wikipedia.org/wiki/File:Game_of_life_glider_gun.svg

Example: membrane systems



Snoopy

Colored Petri nets-based framework



Features for modeling

- Drawing of the Petri net graph as usual.
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- Several special transitions: stochastic transitions with freestyle rate functions, immediate transitions, deterministic transitions, and scheduled transitions.
- Concise specification of initial marking for larger color sets.
- Rate function definition for each transition instance.
- Highlighting the markings, color sets, guards, and expressions.

Features for animation (for QPN^C/SPN^C)

- Automatic animation,
- Single-step animation by manually choosing a binding.

Features for simulation (for SPN^C / CPN^C)

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- Show or export simulation results for colored or uncolored places/transitions separately or together.

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- Show or export simulation results for colored or uncolored places/transitions separately or together.
- Several simulation algorithms to simulate SPN^C, including the Gielespie stochastic simulation algorithm (SSA) [Gil77].
- Several simulation algorithms to simulate CPN^C, including the Euler algorithm, Runge-Kutta algorithm etc.

Ref: [Gil77] Gillespie D. T.: Exact stochastic simulation of coupled chemical reactions. Journal of Physical Chemistry 1977, 81(25):2340-2361.

Features for export

- QPN^C, SPN^C and CPN^C are exported to different net formalisms within Snoopy,
- Export/import beyond Snoopy, e.g., export to CPN tools [CPN].

Ref: [CPN] http://cpntools.org

Thank You for Your Attention!