Tales of the Petri Nets

Closed systems. Have a set of species, transitions, input arcs (tokens in), output arcs (tokens out).

To open them use multicospans (legs to feet) and "open" them (expose legs, (here just ports) to other).

Use UWDs as the compositional logic.

Structure of a Petri Net

Species

Holders of tokens

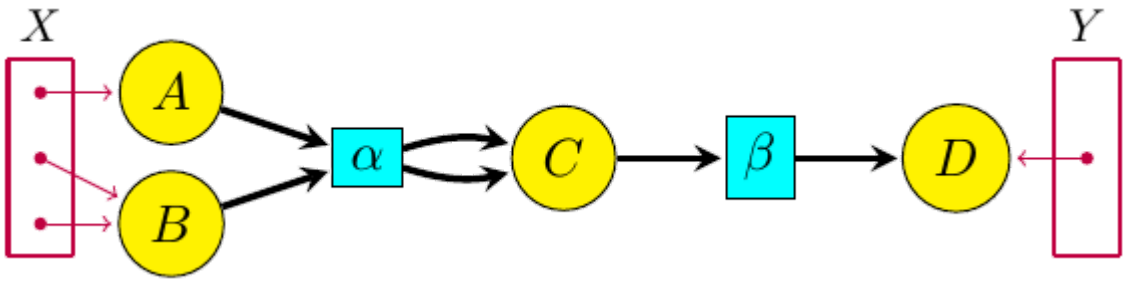
Transitions

Ways of moving around tokens

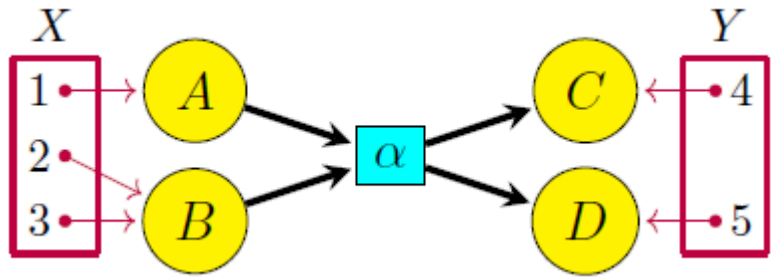
Arcs

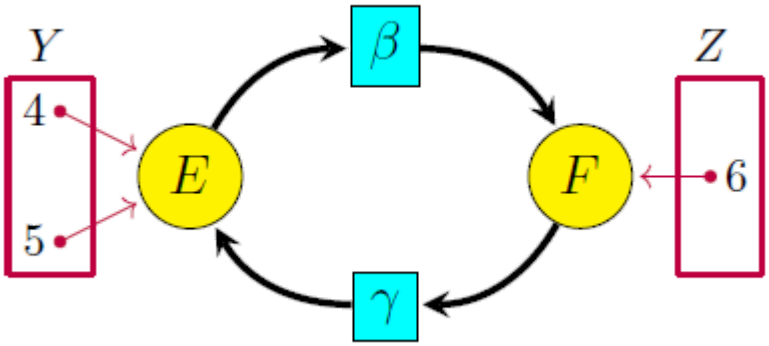
Link sources to transitions (input and output)

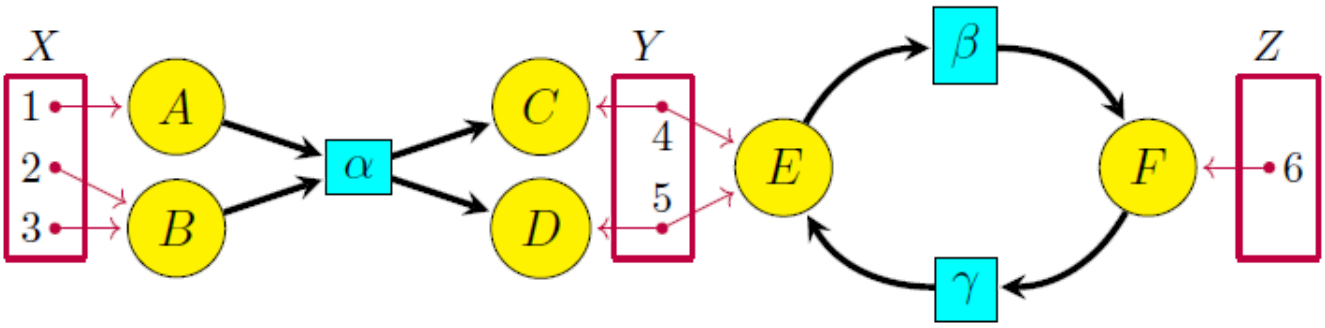
Open Petri Nets



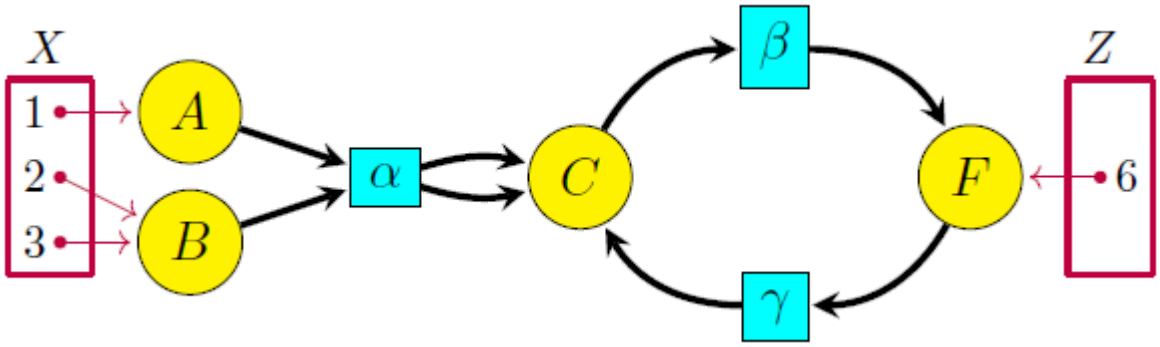
X, Y are two sets which map to the set of species. This mapping itself is very powerful and "opens" up the Petri Nets and set them up for composition with other petri nets.







Use a pushout :) and compose away



How we are using Petri Nets?

Essentially as a graphical representation of mass action kinetics

$$\dot{u}_s = \sum_{t \in p(s)} \phi_t - \sum_{t \in r^{-1}(s)} \phi_t, \qquad \text{where} \qquad \phi_t := \beta_t \prod_{s \in r(t)} u_s$$

Categorical Representation

We use structured multicospans as a way of representing Open Petri Nets and compose them visually through the help of UWDs which are nice covers hiding the underlying pushout stuff going on. AlgebraicPetri still requires you to use ACSetTransforms and pushouts to compose UWDs.

UWDs

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