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Übungsaufgaben zur Vorlesung Zeit und Petrinetze SS 2008

Übungsblatt 5
Besprechung am 27.05.2007

Aufgabe:

Geben Sie eine (formale) rekursive Definition des Erreichbarkeitsgraphen eines beliebigen IPNs an.

Aufgabe:

Beweisen Sie Satz 2.11.

Aufgabe:(fakultativ)

Modellieren Sie mit einem klassischen PN das folgende System, das eine Vereinfachung der Interaktionen zwischen den Proteinen cdc2 und cyclyn bei der Zellenteilung beschreibt:

The relationship between cyclin and cdc2 in the cell cycle: In step 1, cyclin is synthesized *de novo*. Newly synthesized cyclin may be unstable (step 2). Cyclin combines with cdc2-P (step 3) to form pre-maturation promoting factor (preMRF). At some point after heterodimer formation, the cyclin subunit is phosphorylated. The cdc2 subunit is then dephosphorylated (step 4) to form active MPF. In principle, the activation of MPF may be opposed by protein kinase (step 5). Assuming that active MPF enhances the catalytic activity of the phosphatase, we arrange that MPF activation is switched on in an autocatalytic fashion. Nuclear division is triggered when a sufficient quantity of MPF has been activated, but concurrently active MPF is destroyed by step 6. Breakdown of the MPF complex releases phosphorylated cyclin, which is subject to rapid proteolysis (step 7). Finally, the cdc2 subunit is phosphorylated (step 8, possibly reversed by step 9), and the cycle repeats itself.

(Tyson, J., *"Modeling the cell division cycle: cdc2 and cyclin interactions"*, Prod.Nat.Acad.Sci. USA,Vol. 88, 1991)