Information Modelling and Validation with Petri Nets
Overview and Case studies

Exercise 1 (PN concepts): Recall the following concepts and principles of Petri Nets:

1. What is a place? What is token? What is a place marking?
2. Draw a place with name “Book”, with six (6) instances of such book.
3. What is transition? What means an input arc from a place P to a transition T with inscription number N ? What means an output arc from a transition T to a place Q with inscription number M ? Draw such arcs, places P and Q and transition T (with N=2 and M =1).
4. What means a transition is enabled? What means firing a transition?
5. Give in 3. the marking of P three(3) tokens and Q zero(0) token a try to fire it (several times).

Exercise 2 (ER versus PN concepts): We want understand more on the relationship between the entity relationship and the conception of the behavioral features of an information system using Petri Nets.

A. Establish a possible relationship between this very simplified library E/R and possible Petri nets modeling of the behavior. We know that each borrowed book should returned!. Consider the case of penalty. Consider the case of reactivity (event borrow). Consider the case of requiring the library-card?

B. Do the same for the following simplified banking accounts E/R modeling. To withdraw first you to open, deposit the account and then one can deposit, withdraw until the account is closed.
C. Do the same with the ATM case. First we have to enter the card, enter the code, enter the amount and finally get the money. Discuss the case when the code is not valid. Allow the user three attempts. Perform some animation?
Exercise 3 (Some on understanding the animation): We want to conceive a vending-machine that delivers: Caffe (2$ 15C), chocolates (3$ 45C). The machine accepts only 2$ coins.
- Conceive an E/R model for that machine?
- Conceive the Petri Net that simulate this machine-behavior?
- Animate it for a person that has 10$ and wants a cup of caffee and two chololates?

What will changes if the machine accepts also 1$ coins? And it can deliver tea with 90C a cup?
Force the machine to first accept the coin and give you explicitly the choice between the goods? Give the possibility of the operating-person to get the (obtained inside) money?

Exercise 4 (Little bit of mathematic): For the Petri net below, compute the following:
1. The Incidence-matrix ? (A)
2. The Initial-marking (M0)
3. We want to fire t2, t3, t4. Compute the resulting marking ?

Exercise 5 (More about the PN formalism): Construct the reach ability graph for the Petri Net below.
Exercise 6 (More about the PN formalism): Compute for the Petri Net below the following:

1. Show that the marking $M = (0 \ 0 \ 1)$ is reachable?
2. With an initial marking $M_0 (0 \ 1 \ 0)$, what happen by firing successively $t_2$ and $t_3$? How we call and formulate that?