Embedded systems: Assignment 3

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Contents

1 Introduction

In this document I will show and explain my solutions to the tasks detailed in Assignment 3 of the course Embedded Systems 2018.

2 Assignment 3.1

For the first part of this assignment I was tasked to create a Petri net model of a four-way intersection for cars. On this intersection cars are only allowed to drive straight, and they have to give priority to cars on their right. Fig. 1 shows my solution for this task, with an example initial token distribution. I use inhibitors to prevent cars from driving as long as there's a car coming from their right, or when a car from the left or right is already on the intersection. Cars from opposite directions may cross the intersection simultaniously.

It is possible for the cars to come into deadlock, when a car from each direction is waiting to cross. I did not solve this, as this is not disallowed by the assignment. In order to solve it, one could add another level of priority, e.g. by adding another event that can be fired when cars are waiting from all directions and no cars are crossing, and results in one or two cars crossing the intersection. In the case of two cars crossing they would have to come from opposite directions to prevent collisions.

3 Assignment 3.2

The assignment was to compute $Z = A \times \min(B, 2 \times C)$ using Petri nets. My solution is shown in Fig. 2. For the sake of being an example, there are tokens present in the net, so that it shows a possible initial state of the aforementioned equation.

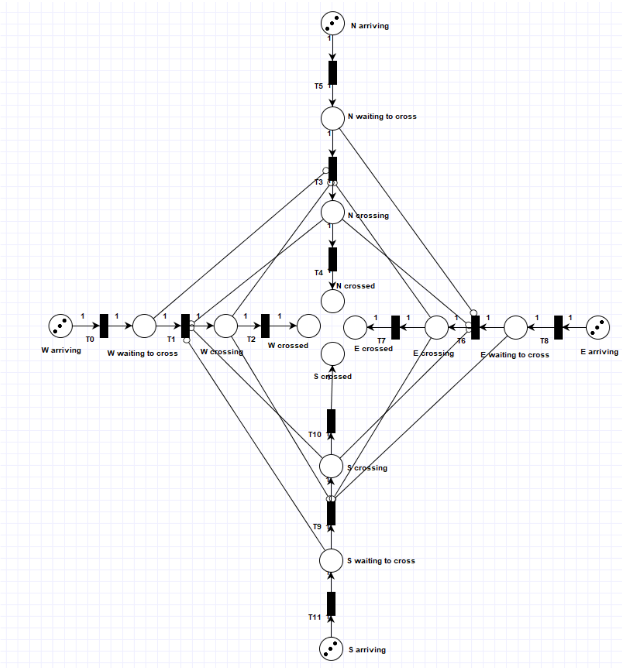

Figure 1: *My solution to assignment 3.1, this image was created using PIPE 5 [1, 2]. The N, E, S and W stand for the cardinal directions. For each direction, a car is first driving towards the intersection (arriving), then reaching the intersection and waiting to cross (waiting), then driving on the intersection (crossing), and finally they leave the intersection (crossed).*

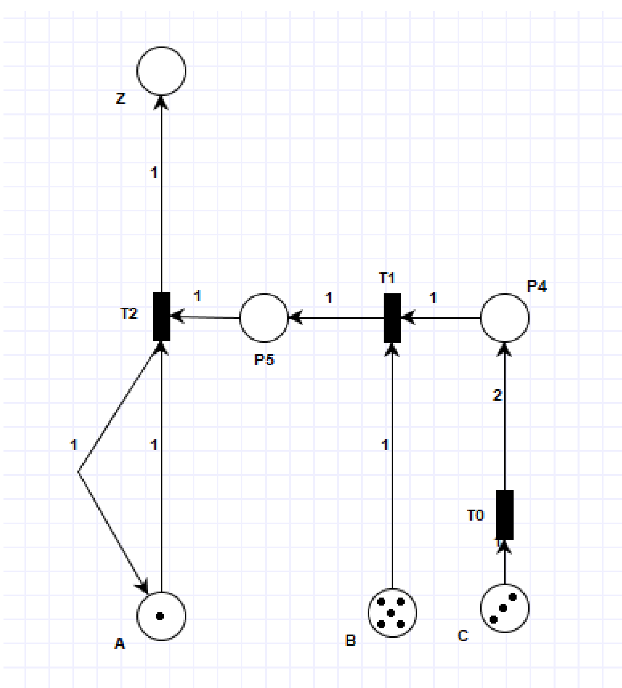

Figure 2: *My solution to assignment 3.2, this image was created using PIPE 5 [1, 2].*

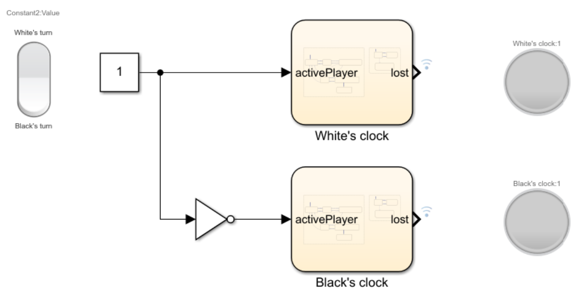

Figure 3: *The outside view of my solution to assignment 3.3: there is one chess clock for each player, the switch tells which player's turn it is, and the lights are green if a player is still playing and red if a player loses. This image was created using PIPE 5 [1, 2].*

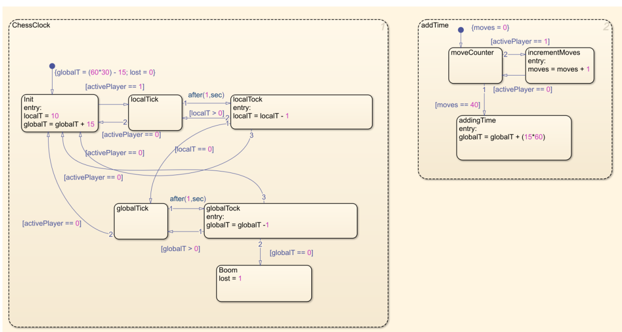

Figure 4: *My solution to assignment 3.2, this image was created using PIPE 5 [1, 2].*

4 Assignment 3.3

I made a chessclock library in Simulink (see Fig. 3 and Fig. 4), since it had to be the same for both players. The only downside is that the number of moves taken is now measured twice.

References

[1] Nicholas J Dingle, William J Knottenbelt, and Tamas Suto. Pipe2: a tool for the performance evaluation of generalised stochastic petri nets. *ACM SIGMETRICS Performance Evaluation Review*, 36(4):34–39, 2009.

[2] Pere Bonet, Catalina M Lladó, Ramon Puijaner, and William J Knottenbelt. Pipe v2. 5: A petri net tool for performance modelling. In *Proc. 23rd Latin American Conference on Informatics (CLEI 2007)*, 2007.