

Chapter 3 - exercises

3.1 Show that $S1$ and $S2$ describe the same behavior:

$$\begin{aligned} P &= (a \rightarrow b \rightarrow P) . \\ Q &= (c \rightarrow b \rightarrow Q) . \\ || S1 &= (P || Q) . \end{aligned}$$

$$S2 = (a \rightarrow c \rightarrow b \rightarrow S2 \mid c \rightarrow a \rightarrow b \rightarrow S2) .$$

- 3.2 $ELEMENT = (up \rightarrow down \rightarrow ELEMENT)$ accepts an `up` action and then a `down` action. Using parallel composition and process $ELEMENT$ describe a model, with interface actions `up` and `down`, that can accept up to four consecutive `up` actions before a `down` action. Draw a Structure Diagram for your solution. (Hint – see `TWOBUFF`)
- 3.3 Extend the model of the client-server system $CLIENT_SERVER$ such that there can be more than one client using the server.
- 3.4 Modify the model of the client-server system described in question 3.3 such that the call may terminate with a timeout action rather than a response from the server. What happens to the server in this situation?
- 3.5 A roller coaster control system only permits its car to depart when it is full. Passengers arriving at the departure platform are registered with the roller coaster controller by a turnstile. The controller signals the car to depart when there are enough passengers on the platform to fill the car to its maximum capacity of M passengers. The car then goes around the roller coaster track and then waits for another M passengers. A maximum of M passengers may occupy the platform. Ignore the synchronization detail of passengers embarking from the platform and car departure. The roller coaster consists of three processes $TURNSTILE$, $CONTROL$ and CAR . $TURNSTILE$ and $CONTROL$ interact by the shared action `passenger` indicating an arrival and $CONTROL$ and CAR interact by the shared action `depart` signaling car departure. Draw the Structure Diagram for the system and provide FSP descriptions for each process and the overall composition.
- 3.6 Modify the example Java program `ThreadDemo` such that it consists of three rotating displays.