Practical Class 2 — Parallel Processes[1]

This practical class uses ProBE to explore the behaviour of parallel combinations of processes.

Getting Started

Move to your CSP directory, and start ProBE in the background as usual. Also start an editor.

The Student and the Parent

1. Copy the file `student1.csp` to your own directory. Look at the file in an editor. Notice the definitions of the sets of events S and P, with {| and |} as the set delimiters. Also notice the use of `[ S || P ]` instead of ${}_S\|_P$.

2. Load `student1.csp` into Probe. Select *SYSTEM* and explore its behaviour. Use both the explorer window and the trace view to understand what the process can do. Are there any surprises?

3. Draw a transition diagram for *SYSTEM*.

Independent Processes

1. Copy the file `independent.csp` to your directory, look at the definitions, and load it into ProBE.

2. Notice that the processes *LR* and *UD* have disjoint (non-overlapping) alphabets. Is any synchronisation required? Explore the behaviour of *UDLR* and draw a transition diagram.

[1] This practical sheet is provided as course material to accompany the book 'Concurrent and Real Time Systems'.

How many states?

1. How many states can LR and UD be in? How many states can $UDLR$ be in? What is the relationship between these numbers?

2. Change the definitions so that

$$LR = \mathit{left} \rightarrow \mathit{right} \rightarrow \mathit{middle} \rightarrow LR$$

   (you will need to declare the new event and also change the alphabets in the parallel combination).

3. Draw another transition diagram for $UDLR$ and count the states. Check that you have correctly understood the relationship between the number of states of LR, UD and $UDLR$.

4. How many states do $STUDENT$ and $PARENT$ have? How many states does $SYSTEM$ have? Can you explain these numbers?

Synchronisation

1. Copy the file `prize.csp` to your directory, and look at it. The definitions correspond to the example of the student who receives a prize on completion of the degree without any failures.

2. Load `prize.csp` into ProBE and explore $SYSTEM$. Does it behave as you expect?

3. What is the problem with the definitions in `prize.csp`? Modify them so that $SYSTEM$ behaves as we wanted it to.

Traces

For each of the examples above, look at some traces of the parallel system. What can you say about the relationship between the traces of the whole system and the traces of the individual processes? If you know all the possible traces of P and all the possible traces of Q, can you predict the possible traces of $P \;{}_A\|_B\; Q$?