Concurrency Exercises 4: FSP theory

Topics 2.3 and 2.4: FSP Theory

These are some exercises in the use of FSP rules, constructing derivations, and the semantics via LTAs. The questions are answered by application of the set of FSP rules and bisimilarity. There are more questions on FSP (with full answers available) in Exercise Sheet 6.

1. Given the parallel composition $S_1$,

   $P = (a \rightarrow b \rightarrow P)$.
   $Q = (c \rightarrow b \rightarrow Q)$.
   $||S_1 = (P || Q)$.

   use the transition rules defined in lectures to calculate all of $S_1$’s possible initial transitions. Then calculate the transitions that are possible after the initial ones.

2. Show that $S_1$ and $S_2$ describe the same behaviour:

   $P = (a \rightarrow b \rightarrow P)$.
   $Q = (c \rightarrow b \rightarrow Q)$.
   $||S_1 = (P || Q)$.

   $S_2 = (a \rightarrow c \rightarrow b \rightarrow S_2 | c \rightarrow a \rightarrow b \rightarrow S_2)$.

   Let $P_1 = (b \rightarrow P)$ and $Q_1 = (b \rightarrow Q)$.

3. Are $P_1$ and $P_2$ below isomorphic? Are they trace-equivalent? Are they bisimilar? Why?

   $P_1 = (a \rightarrow P_1)$.
   $P_2 = (a \rightarrow P_2$
   $\ | a \rightarrow $STOP $)$.

4. Show that bisimilarity $\sim$ is an equivalence relation (i.e. that it is reflexive, symmetric, and transitive.)

5. Are $S_1$ and $S_2$ bisimilar ($S_1 \sim S_2$)? Are they weakly bisimilar ($S_1 \approx S_2$)?

   $P = (a \rightarrow b \rightarrow P)$,
   $Q = (c \rightarrow b \rightarrow Q)$,
   $||S_1 = (P || Q) \ \{b\}$.

   $S_2 = (a \rightarrow c \rightarrow S_2$
   $|c \rightarrow a \rightarrow S_2)$.