

PBES Exercises, March 25, 2015

Consider the LPE description of a lossy channel system, where actions r, s and l represent *receiving*, *sending* and *losing*, respectively, and the action τ represents some internal behaviour of the system.

$$\begin{aligned} P(b:Bool, n:Nat) &= \sum_{m:Nat} \neg b \longrightarrow r(m) \cdot P(\text{true}, m) \\ &+ b \longrightarrow s(n) \cdot P(\text{false}, n) \\ &+ b \longrightarrow l \cdot P(\text{true}, n) \end{aligned}$$

Let ϕ be the first-order modal μ -calculus formula given below:

$$\nu X. \mu Y. (([\neg l]X \wedge (\nu Z. \exists j:Nat. \langle r(j) \vee l \rangle Z)) \vee [\neg l]Y)$$

1. Compute the PBES that is the result of the transformation $\mathbf{E}(\phi)$ applied to P .
2. Solve the resulting PBES using symbolic approximation. Show all steps in all your computations.
3. Solve the resulting PBES using instantiation. Hint: first eliminate redundant parameters of the given PBES, and use logic to rewrite the right-hand side of the PBES. Show all steps in all your computations.