
Software Architecture and Calculi

Problem 1

18 March 2021 - 1 April 2021

Please provide a complete, individual answer and quote suitably any reference (paper, book, software) used.

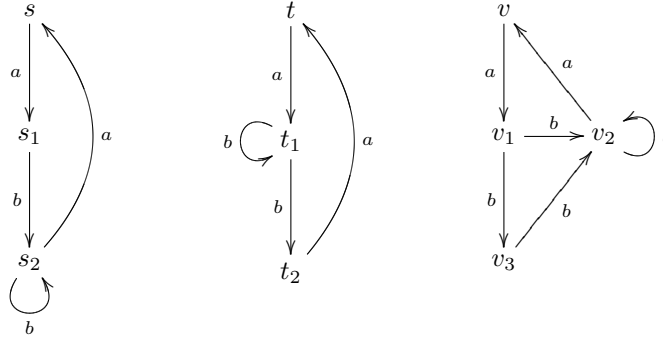
1. Make yourself familiar with MCRL2 (read the documentation and try examples). Write a short note (maximum 3 pages) explaining carefully, for the layman, with a running example, how the tool can be used. Extra bonus to answers not relying in (non modified) examples available from the tool documentation.
2. Consider the following description of a two-position *buffer* with acknowledgements. Note the process is built from copies of a 1-position *buffer* also with acknowledgements: it acknowledges in \bar{r} the reception of a message and waits in t the confirmation that a message sent was arrived to its destination.

$$B_s \hat{=} (B(\text{in}, \text{mo}, \text{mi}, r) \mid B(\text{mo}, \text{out}, t, \text{mi})) \setminus_{\{\text{mo}, \text{mi}\}} \\ B(\text{in}, \text{out}, t, r) \hat{=} \text{in}.\overline{\text{out}}.t.\bar{r}.B$$

Use MCRL2 to help answering the following questions.

- (a) Check whether the behaviour of B_s is the intended one (drawing, for this purpose, the corresponding transition graph)
- (b) Find a solution to the problem detected (if any) and draw the corresponding transition graph.
- (c) Explain how the specification given (or your new solution) can be adapted to describe *buffers* with an arbitrary, but fixed number of positions.
- (d) Formulate safety and liveness properties that process B_s may verify and use MCRL2 to check them.

3. Consider the following labelled transition systems.



- Show that states s , t and v are not bisimilar and determine the modal properties which distinguish between them.
- Use MCRL2 to verify your answer to the previous question.