COMP2620/6262 (Logic) Tutorial

Week 11

Semester 1, 2025

Tutorial Quiz

In each tutorial, apart from week 2, there is a short quiz on skills practised in the previous tutorial. Your top 7 quiz attempts, out of the 9 available, will collectively count for 50% of your final mark.

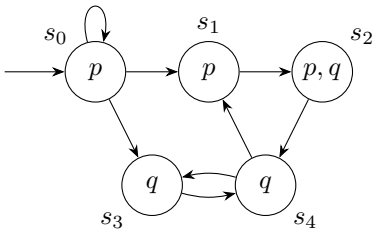
This week's quiz is on **modelling English into CTL***. Your tutor will hand out blank paper, on which you should clearly write your university ID and name. Your tutor will also hand out paper with an English language description of current and future states of a situation. You will translate each line of the description into a CTL* proposition. You must use CTL* syntax - not LTL or CTL, even if you feel that an LTL or CTL proposition could be used. Where you believe the English language description is ambiguous, you will be asked to present what you think is the most plausible translation, and then briefly discuss what other translations might be reasonable. You will have **eight minutes** to do this.

You are not permitted to have any other resource on the table during this quiz, including any electronic device. If you finish your quiz before time elapses you may put your hand up and your tutor will collect your sheet. Once you have done this, you may get a device out and start work silently on this week's questions. If you are still working when time elapses you must stop writing immediately and let your tutor collect your paper.

There will be no tutorial next week, and so no quiz.

This Week's Exercises

1. Model check the following CTL propositions against the transition system below. You should label all states.

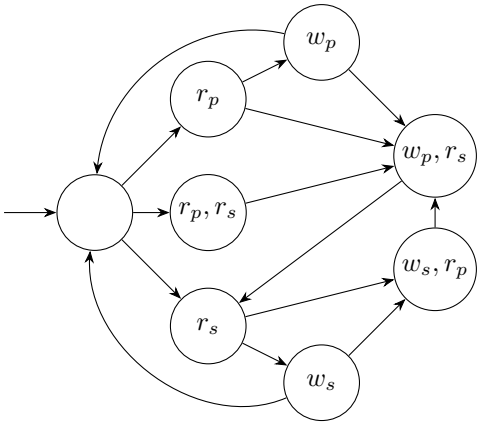


   - $EX(p \wedge EXq)$
   - $E[p\, U\, \neg p \wedge EXp]$
   - $EG\neg EG(p \wedge \neg q)$

2. Identify the Strongly Connected Components (SCCs) in the transition system above. Are any of them trivial?

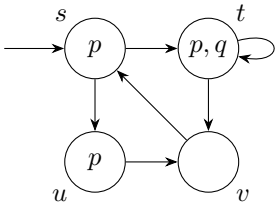
   If you did not do so already, solve the final part of question 1 using the more efficient SCC method (if you did use that method, you could instead try out the simpler deletion-based method).

3. This system models a priority process and a secondary process which both need access to some non-shareable resource. Requests come in for these processes (r_p, r_s) and they can do work (w_p, w_s), but the priority process takes precedence, with requests for it even making the secondary process pause if it has started its work. We assume that after each process finishes work it must be inactive for one step to check whether it has any pending requests.



- State a CTL proposition that means that, if the secondary process starts work, it will eventually become inactive (neither working nor holding a pending request).
- Give a reason (informally) that this proposition fails.
- Perhaps it is not plausible that the primary process would be always active, or just about to become active. Model check the CTL proposition from the first part of this question, replacing each A by A_C and E by E_C, where C is the single fairness constraint $\{\neg w_p \wedge \neg r_p \wedge \neg EX r_p\}$.

4. Model check the following LTL propositions against the transition system below. You should label all states in your expanded transition system. You will need to convert som of the propositions to use only the set of connectives that we learned to model check: $\bot, \neg, \wedge, X, U$.



- $p \wedge Xp$
- $p\,U\,q$
- GFp