

System Specification and Verification

- Homework 1 -

Spring 2026

Model and verify at least two CTL properties on each of the following cases using a model-checker from below:

- NuSMV : <http://nusmv.fbk.eu/>
https://www.researchgate.net/publication/220643491_NUSMV_a_new_symbolic_model_checker
- SPIN : <http://spinroot.com/spin/whatispin.html>
- MCMAS : <https://vas.doc.ic.ac.uk/software/mcmas/>
<https://link.springer.com/content/pdf/10.1007%2Fs10009-015-0378-x.pdf>

1. **A simple mutual exclusion algorithm** for two processes that at each moment have one of the following statuses: non-critical (n_i), trying to access critical section (t_i) and in critical section (c_i).
2. **Farmer Crosses River Puzzle** A farmer wants to cross a river and take with him a wolf, a goat, and a cabbage. There is a boat that can fit himself plus either the wolf, the goat, or the cabbage. If the wolf and the goat are alone on one shore, the wolf will eat the goat. If the goat and the cabbage are alone on the shore, the goat will eat the cabbage. How can the farmer bring the wolf, the goat, and the cabbage across the river?
3. **Dining cryptographers** Five silent philosophers sit at a round table with bowls of spaghetti. Forks are placed between each pair of adjacent philosophers. Each philosopher must alternately think and eat. However, a philosopher can only eat spaghetti when they have both left and right forks. Each fork can be held by only one philosopher and so a philosopher can use the fork only if it is not being used by another philosopher. After an individual philosopher finishes eating, they need to put down both forks so that the forks become available to others. A philosopher can take the fork on their right or the one on their left as they become available, but cannot start eating before getting both forks. Eating is not limited by the remaining amounts of spaghetti or stomach space; an infinite supply and an infinite demand are assumed. The problem is how to design a discipline of behavior (a concurrent algorithm) such that no philosopher will starve; i.e., each can forever continue to alternate between eating and thinking, assuming that no philosopher can know when others may want to eat or think.