

Assignment 4: Missionaries and Cannibals in NuSMV Model Checker

CS 5100/6100 – Foundations of Computer Science

March 27, 2013

Deadline: Monday, Apr 15, 2013 at 11:59pm.

The Missionaries and Cannibals Problem: Three cannibals and three missionaries are on the left side of a river. There is one boat that can carry two people. (The boat of course needs to be ferried by at least one person.) If at any point there are more cannibals than missionaries on one bank, the cannibals eat the missionaries. The goal is to bring all of the missionaries and cannibals on the other side of the river without anybody getting eaten.

Your Task: Formalize the problem as a NuSMV program (i.e., model) and add a temporal logic specification to check the existence of a solution. Basically, you have to reduce the question “can all three missionaries and three cannibals cross to the right side?” to a model checking problem by stating the question as a CTL property. Violation of the stated property should give you a sequence of steps leading to the solution in the form of a NuSMV counterexample.

Make sure that your model includes all possible scenarios for crossings, even pointless ones such as one cannibal takes the boat to the other side and then comes back. More specifically, you need to let people travel back from the right bank to the left bank.

Note that this is simple problem and we know how to solve it manually. The point of this assignment is to get the tool to find the answers for you, and not yourself. So, in addition to the source code that you submit, please also submit a short write-up that includes the output of NuSMV and a short explanation why/how the output provides an answer to the posed question.

Assignment Deliverables: The deliverables are source code of your solution (NuSMV input file) and the mentioned short write-up as a PDF document. Annotate your input file with comments where needed so that I can understand how your encoding of the problem works. Email me your deliverables; if you don’t get a confirmation I received it within several hours, email me again.