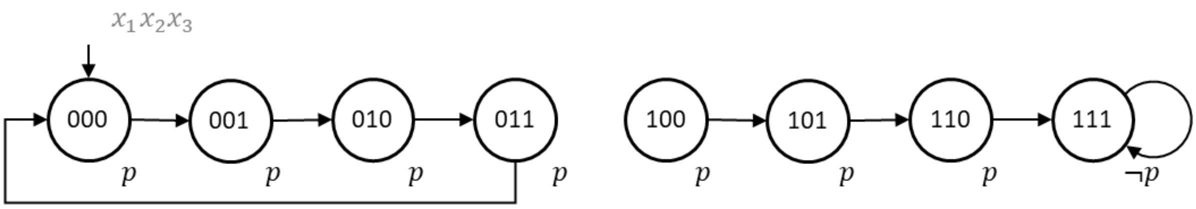
Model Checking Homework 4

Deadline: 22 April 4:00pm
Send solution to: modelchecking@iaik.tugraz.at
update, 2021-04-15 5:32 PM: Added explanation that p is to be checked, corrected numbering of exercises.

Consider the following Kripke structure K.



We will use the variant of PDR shown in class to prove that p always holds. (If you want to use a different variant, talk to us first.) Clearly indicate the steps. Indicate at least the frames at every step, the function calls, and the generalizations you use. The two subtasks differ in how to build the generalizations. We will use a generalization algorithm that finds a relative inductive clause from a fixed order of preference.

Task 4a. [5 points]. Suppose the state is $s = l_1 \wedge l_2 \wedge l_3$, where $l_i = x_i$ or $l_i = \neg x_i$. The following is a list of all cubes that are implied by s.

$$true, l_1, l_2, l_1 \wedge l_2, l_3, l_1 \wedge l_3, l_2 \wedge l_3, l_1 \wedge l_2 \wedge l_3$$

The generalization algorithm takes the first cube from this list such that its negation is relative inductive with respect to F_i. This order should allow you to find the inductive invariant quickly. (Note that false is not relative inductive to any clause, because of initialization.)

Task 4b. [5 points]. Now use the following order, which should lead to more iterations:

$$true, l_3, l_2, l_3 \wedge l_2, l_1, l_3 \wedge l_1, l_2 \wedge l_1, l_1 \wedge l_2 \wedge l_3.$$