

Model Checking (SS 2023) Homework 4

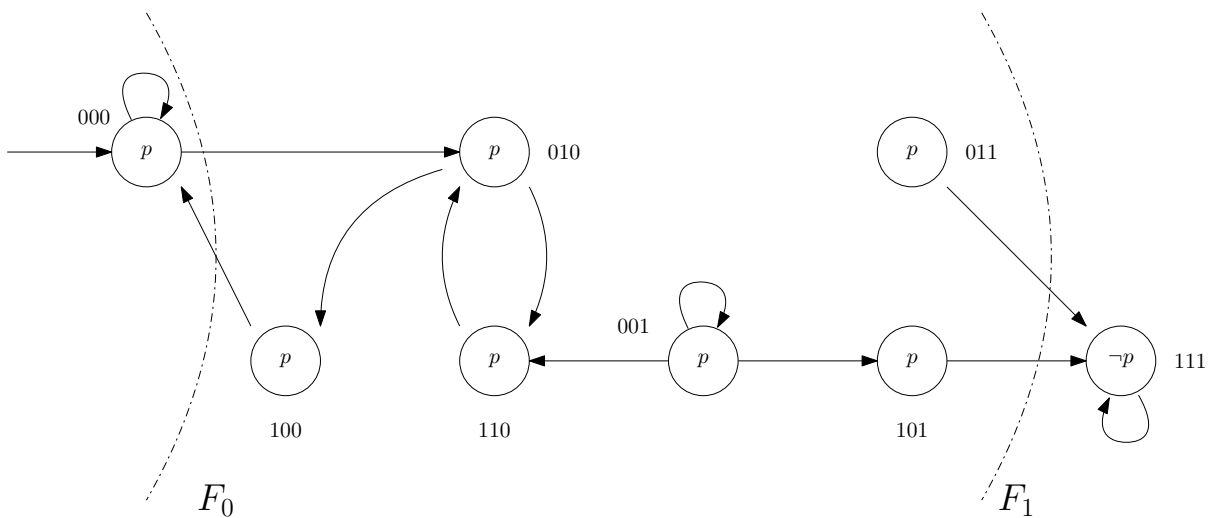
Deadline: **April 27, 2023, 4:00 pm**

Send your solution to modelchecking@iaik.tugraz.at

Homework can be done in groups of 1 or 2 students.

The groups need not be the same for each homework.

Consider the following Kripke structure K , with states $(x_1, x_2, x_3) \in \{0, 1\}^3$ and atomic proposition p , which holds in all states except 111. We want to use PDR to prove whether the property AGp is true. We begin the algorithm, obtaining frames F_0 and F_1 as shown in the figure.



Task 1. [3 points] Starting from the figure, carry out two iterations of the first variant of PDR shown in class (from $k = 1$ until $k = 3$). Clearly indicate the steps and the frames at the end of each iteration. Is the property AGp verified in the end? Explain why or why not.

Task 2. [3 points] As in Task 1, perform two iterations of PDR starting from $k = 1$, but this time use *naive generalization* during the removal of bad states, as shown in class. Is the property AGp verified in the end? Explain why or why not.

Task 3. [4 points] For each of the following statements, explain whether they are true or false. Justify your answer.

1. The set $\neg x_1$ is inductive.
2. The set $\neg x_3$ is inductive.
3. The set $\neg x_2$ is inductive relative to $\neg x_1$.
4. The set $\neg x_3$ is inductive relative to $\neg x_1$.