

# Mathematical Structures in Formal Methods, *MSFM*

## Handout for Lecture 7 (2018/6/14)

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## 1 Today's Lecture

The Cousot–Cousot construction. Proof methods from the two fixed-point theorems. Go back to [Vardi, Section 2.5, 2.6], on alternating automata and games.

## 2 Report Assignment

### 2.1 Logistics

- Due: the beginning of the next lecture
- Hand in a hard copy, or submit electronically
  - To: `i.hasuo [at] acm.org` and `soichi [at] is.s.u-tokyo.ac.jp` (Soichiro Fujii, TA).
  - Title: “MSFM Report Assignment” (we filter messages)
- Put your name in your pdf (we print them)

### 2.2 Problems

1. (About alternating automata on finite words) Consider the following alternating automaton:

$$(\{a, b\}, \{s_0, s_1, s_2, s_3\}, s_0, \rho, \{s_0, s_1\})$$

where the transition function  $\rho$  is given by the following.

$$\begin{array}{ll} \rho(s_0, a) = s_0 & \rho(s_0, b) = s_0 \wedge s_1 \\ \rho(s_1, a) = s_2 & \rho(s_1, b) = \text{true} \\ \rho(s_2, a) = s_1 & \rho(s_2, b) = s_2 \vee s_3 \\ \rho(s_3, a) = s_3 & \rho(s_3, b) = \text{false} \end{array}$$

Present a run that witnesses that the word *abbaabaa* is accepted.

2. Follow the construction of Theorem 22 in [Vardi] and translate a formula  $G(p \supset Fq)$  into an alternating Büchi automaton.