

## Advanced Distributed Algorithms and Data Structures

WS 2016

### Homework Assignment 5

#### Problem 1:

- a) Finish the proof of Theorem 6.1.
- b) Show for the MIMD protocol on slide 20 and  $\sum_v p_v(t) \ll 1$  that the larger  $p_v(t)$ , the larger is  $\mathbb{E}[p_v(t+1)]/p_v(t)$ .

#### Problem 2:

Implement and test solutions 1 and 2 on slides 25 and 26 using a simple, sequential simulation: The probability values of the nodes at the beginning of a round are given by an array  $A$  of size  $n$ . During that round, we determine via random experiments, which of these nodes will send a ping message in that round. Based on that, we will then decide based on solution 1 or 2 how to adjust the probabilities.

The task is to observe, for different values of  $n$  and starting conditions, whether  $\sum_v p_v$  converges to 1 and whether we eventually have fairness.