

Distributed Systems, Summer Term 2019

Exercise Sheet 6

1 Leader Election with Failures

Consider the leader election problem on a complete graph in the synchronous message passing model. That is, every node has a unique ID and at end of the algorithm, every node that did not crash has to output the ID of the leader node.

Explain how to adapt the $(f+1)$ -round lower bound proof for consensus from the lecture to show that if at most $f \leq n - 2$ processes may fail during the protocol, at least $f + 1$ rounds are needed to solve leader election.

2 k -set agreement

A generalization of consensus is the k -set agreement problem: Every node has an input value and at the end every node has to output a value such that the following properties are fulfilled:

1. Agreement: There must not be more than k different output values.
2. Validity: Every node must output a value which was input of some node.

Show that on a complete graph in the synchronous message passing model with at most f node failures, the k -set agreement problem is solvable in $\lfloor f/k \rfloor + 1$ rounds.