Distributed Algorithms - Exercise

Winter term 2016/17

CIT

Exercise sheet 2

Exercise 1.1: Bully Algorithm

i. Describe the Bully Algorithm
ii. How many messages are passed for a leader election with the bully algorithm
iii. The Bully Algorithm is an example for a leader election. Give examples of applications that need a unique leader.

Exercise 1.2: Election

i. Implement the algorithm of Chang and Roberts that have been introduced in the lecture. Afterwards evaluate the message complexity of your implementation compared to the formulas provided in the lecture given the following scenarios:
    1. **Worst-Case:** Configure your topology that it reflects the worst-case scenario.
    2. **Best-Case:** Configure your topology that it reflects the best-case scenario.
    3. **Average-Case:** Configure your topology that it randomly assigns node IDs and examine the average message complexity calculated over several runs.
ii. There is a precondition for the algorithm of Chang and Roberts that all node IDs have to be unique (no duplicate IDs). Assume, we drop this precondition and allow multiple nodes to have the same ID.
    1. Does the algorithm still work properly? Please provide a reasonable answer.
    2. In which cases does the algorithm still deliver a proper result? Explain at least two cases.

Exercise 1.3: Process Mesh-Algorithm (Maekawa)

i. What is the advantage of the Maekawa algorithm against the Broadcast Algorithm
ii. The Meakawa Algorithm is not deadlock free. Give an example of a deadlock situation.

Additional notes and assessment:

- important parts of the implementation have to be annotated with comments
- each exercise has to be completed handled in teams of 3-4 students
- the exercise sheet is successfully completed, if exercise 1 was presented and the solution was explained satisfactorily