Principles of Distributed Computing
Exercise 12

1 Determining the Median

Consider a radio packet network with \( n \) nodes and without collision detection. Furthermore, assume that each node has a token of size \( O(\log n) \) (a number) and is equipped with memory of size \( O(\log n) \). Present an uniform algorithm which allows the nodes to determine the median in \( O(n) \) time slots w.h.p.

**Hint:** You can assume that \( n \) is odd and each token is unique.

**Hint:** Initializing first and then trying to determine the median simplifies the task.

**Hint:** With a memory of size \( O(\log n) \) the nodes can count up to \( n \).

2 Maximum

Assume a uniform wireless network with collision detection in which every node is given a number. Give a \( O(\log^2(n)) \) algorithm that finds the highest number w.h.p.

**Hint:** Use the fast Leader Election with CD algorithm from the script

**Hint:** Use the ideas in the proof of the fast Leader Election with CD algorithm and the union bound to prove that your algorithm succeeds w.h.p.