



# Principles of Distributed Computing

## Exercise 10

### 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  $\mathcal{O}(\log n)$  (a number) and is equipped with memory of size  $\mathcal{O}(\log n)$ . Present an uniform algorithm which allows the nodes to determine the median in  $\mathcal{O}(n)$  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  $\mathcal{O}(\log n)$  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  $\mathcal{O}(\log^2(n))$  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.