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 a 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.