

Coloring

Exercise 1: Centralized Coloring

- 1. Present briefly centralized coloring.
- 2. Compute the complexity of centralized coloring.

Exercise 2: Distributed Coloring

A distributed algorithm for coloring is as follows:

Each node v executes the following code: node v sends its ID to all neighbors node v receives IDs of neighbors while node v has an uncolored neighbor with higher ID do node v sends "undecided" to all neighbors node v receives new decisions from neighbors end while node v chooses a the free color node v informs all its neighbors about its choice

- I. Prove that the time complexity of the above algorithm is N and it uses at most delta+I colors (where delta is the maximum degree of the network).
- 2. What is the message complexity of the algorithm (ignore the «undecided» messages in your analysis)?
- 3. Does the algorithm work in the asynchronous environment ?

Exercise 3: log* coloring

- 1. Recall the log* coloring for trees. Compute the message and the time complexity of this algorithm.
- 2. Show how the log* coloring algorithm can be adapted to the rings. Hint : nodes know the size of the network.
- 3. Propose a solution for coloring a tree in O(log*) rounds with 3 colors provided that nodes do not know n.