University of Freiburg
Dept. of Computer Science
Prof. Dr. F. Kuhn
Z. Parsaeian, G. Schmid

Distributed Graph Algorithms
Exercise Sheet 7

Exercise 1: Edge Coloring

Use network decomposition to compute a $(2\Delta - 1)$-edge coloring in $O(\text{poly}(\log n))$ rounds, without using line graphs.
Hint: What extra property should your network decomposition hold so that iterating through the colors of the network decomposition does not creates any conflicts?

Exercise 2: Algorithm

In the lecture, we established that network decomposition is a powerful tool for solving various distributed problems. We specifically proved the existence of an $(O(\log n), O(\log n))$ strong-diameter network decomposition.
Let us now focus on the construction. Show how to compute such a decomposition **deterministically** in $O(\text{poly}(\log n))$ rounds.

Exercise 3: Constant Degree

Show that, on constant-degree graphs, an $(O(\log n), O(\log n))$ strong-diameter network decomposition can be computed in $O(\log^* n)$ rounds.
Hint: you can compute even an $(O(1), O(1))$ strong-diameter network decomposition in $O(\log^\star n)$ rounds.