Graded Homework 1, exercise 6

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Fast Streaming Algorithm for MST (20 points)

In the exercises of week 5, we discussed a streaming algorithm for computing a minimum spanning tree (MST) in $O(\log^2 n)$ passes. The goal of this question is to show a faster algorithm. Recall that in a k-pass streaming algorithm the algorithm is allowed to have k passes over the input graph.

Design a streaming algorithm for computing the MST of the graph, using $\tilde{O}(n)$ total memory and $O(\log n \log\log n)$ passes. The algorithm can use randomization and should work with high probability. You can assume that the weights of the edges in the input graph are non-negative integers in $\{1, 2, \ldots, n^{10}\}$.

Hint. Note that if you want to compute outgoing edges from a small number of connected components, you can sample a large number of edges adjacent to each connected component without violating the memory constraints of the algorithm. Show how to exploit this.

Solution