Przemysław Uznański 20/01/2020

Algorithms for Big Data

Fall Semester 2019

Exercise Set 13

Exercise 1:
Show that k-spanner of a graph is in fact k-coreset for distance queries. That is, if G' is k-spanner of G, then for any H and any u, v there is $d_{G\cup H} \leq d_{G'\cup H}(u,v) \leq k \cdot d_{G\cup H}(u,v)$.

Exercise 2:
Show that k-spanners have disjoint-merge property.

Exercise 3:
Show construction of $2t$-spanner of size $\mathcal{O}(n^{1+\frac{2}{t-1}} \log W)$ for weighted graphs with integer edge weights from $\{1, \ldots, W\}$.

Exercise 4:
Show a graph-certificate for 2-edge connectivity. (G is 2-edge connected if any pair of vertices are connected by at least two edge-disjoint paths.)

Exercise 5: (No sparse directed spanners)
Show that in a directed case, for some digraphs it is impossible to construct better than $\Omega(n^2)$-size directed spanners.