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Mobile Computing
Exercise 6

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Due: January 9, 2006

1 Degree of Euclidean Graphs

In the lecture the four Euclidean graphs Minimum Spanning Tree (w.r.t. the Euclidean length of edges) MST, Relative Neighborhood Graph RNG, Gabriel Graph GG, and Delaunay Triangulation DT have been introduced. Which of these four graphs has degree bounded by a constant? Give a reasoning if you think a graph has bounded degree, or draw a counterexample if you believe a graph can have unbounded degree.

2 Gabriel Graph Spanner Property

You have seen in the lecture that the Gabriel Graph GG contains the energy-minimal paths (and is therefore an energy-spanner with spanning factor 1). Do you think GG is also a Euclidean spanner, i.e. with respect to the Euclidean length of edges? If you think so, give a reasoning; if not, provide a counterexample.

3 Geographic Routing

The policy to switch a face in Face Routing introduced in the lecture is not the only plausible strategy. Instead of switching the face at the closest virtual point on the face intersecting (s,t), another strategy could be to switch faces at the node on the face nearest to the destination. Considering this policy, show that Face Routing is able to deliver all packets to their destinations, or provide a counterexample if not.

4 Non-Planar Graphs

In the lecture geographic routing was always assumed to be executed on planar graphs. Is this constraint necessary or would face routing also succeed on non-planar graphs?

Furthermore, the Unit Disk Graph model does not resemble reality that well. A more realistic model is the so called Quasi Unit Disk Graph. In this model for any pair of nodes $u, v \in V$ it holds that

- $(u, v) \in E$ if $|uv| \leq d$ and
- $(u, v) \notin E$ if $|uv| > 1$,

with parameter d. If $|uv| \in [d, 1]$ it is not defined if there is an edge or not. For what values of d is geographic routing still possible?