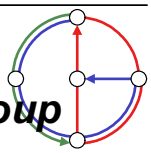
ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Distributed Computing Group



HS 2008 Prof. Dr. Roger Wattenhofer, Nicolas Burri, Philipp Sommer

Ad Hoc And Sensor Networks
Exercise 3

Assigned: October 6, 2008
Due: October 13, 2008

1 Degree of Euclidean Graphs

In the lecture the four Euclidean graphs Minimum Spanning Tree (MST)[1], Relative Neighborhood Graph (RNG), Gabriel Graph (GG), and Delaunay Triangulation (DT) have been introduced. Which of these four graphs has/have a 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

The energy consumption of an edge with Euclidean distance d is often defined as d^α, with $\alpha \geq 2$. The Gabriel Graph (GG) contains the energy-minimal paths and is therefore an energy-spanner with spanning factor 1. Do you think the GG is also a Euclidean spanner, with respect to the Euclidean length of edges? If you think so, give a reasoning; if not, provide a counterexample.

3 XTC in Practical Settings

The XTC Algorithm was described in the lecture. It was stated, that the algorithm produces a topology with maximal node degree of 6 if the underlying network graph is a UDG. Why does XTC result in a bounded degree topology if the given graph is a UDG? Now consider a more practical environment including non-ideal radio propagation and obstacles. Does XTC still produce bounded degree topologies?

4 Benefit of Topology Control

In the lecture, you have seen multiple ways to conserve energy by managing a node's neighborhood. Discuss in which circumstances topology control is useful and when it may be inappropriate. For example, does it make sense to have topology control in dense networks or is it more suitable in sparse topologies? Does the traffic pattern influence your decision for or against topology control?

[1] with respect to the Euclidean length of edges