Exercise Sensor Networks - (till June 6, 2005)

Lecture 6: Routing in sensor networks

Exercise 6.1: SMACS

a) How does the SMACS protocol try to avoid collisions? What is the difference with regard to allocating a communication channel compared to the approaches we got to know to far?

b) How does SMACS solve the hidden/exposed station problem? How can collisions still happen?

c) If two clusters meet it can happen that one cluster can not connect the other. How can this happen and what is the rare resource? Design an example in which one cluster in unable to connect another one.

d) Can bottle necks identified in c) be resolved by sorting the schedules in another way? If yes how, if not why?

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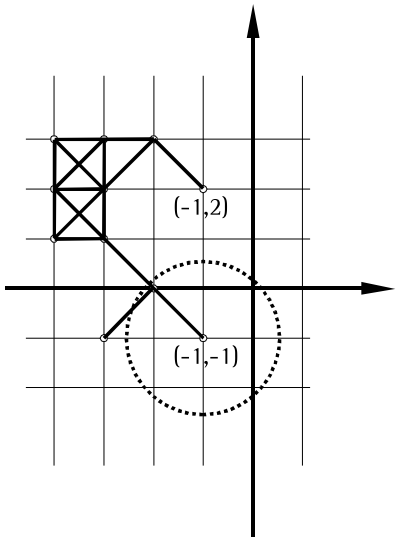
Exercise 6.2: Geographic Hash Tables

a) A number of nodes are shown in the right figure as small dots. Each node has a radio range of 1.5 units. The mutual connectivity of already shown as connecting lines in the figures as well. Reduce the graph according to the Relative Neighborhood Graph (RNG) algorithm to a planar graph.

b) Route a packet according to the GPSR Algorithm from node (-1, -1) to node (-1, 2) and write down the visited nodes.



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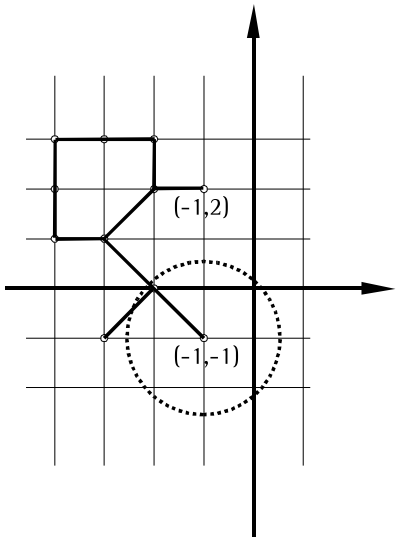
Exercise 6.3: Geographic Hash Tables

c) Node (-3, 2) moves to position (-2, 2). Shortly afterwards the sensor network has to associate some information with position (-3, 2). Which nodes become replica nodes according to Geographic Hash Tables and which one becomes the home node?

d) Some researchers claim that perimeter mode can cause a packet to traverse a network's entire outer boundary. Prove that this is false or show an example.

e) Again, information has to be associated with a specific location. A chain of sensors leads to that location however, in the fashion of a dead-end road. The last node before the considered location is only connected with the chain in one direction. How does perimeter mode behave here?



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Exercise 6.4: GeoCast

In order to route a packet a router has to intersect the target region contained in a packet with the region it is responsible for. Circles and arbitrary polygons are considered in the approach. In order to cut circles with polygons the authors suggest to decompose a circle into a number line segments and cut the evolving polygon using a conventional polygon-polygon intersection.

a) Why is this solution not optimal?

b) Design an approach which treats the circle as such. Think of the normal-based line equation to ease the task.

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