HS 2010 Prof. Dr. Roger Wattenhofer, Philipp Sommer, Johannes Schneider

Ad Hoc And Sensor Networks
Exercise 11

Assigned: December 6, 2010
Due: December 13, 2010

1 Routing with Mobility

In this task we are looking into the problem how bad mobility can influence the performance of a routing algorithm. Assume a network consisting of n nodes. Connectivity between them is defined in a UDG model. Furthermore, we have a round based mobility and communication model. That is, a message is forwarded one hop, then one node is allowed to change its position by ε with $\varepsilon < 1$. Then the routing information is updated in the whole network and the message is forwarded one further hop. Obviously, in this model it is possible to trap messages in the network by disconnecting parts of the network. However, even if connectivity is maintained at all times (that is, the network topology changes but never splits into multiple clusters) messages can be prevented from reaching their destination.

For once you are the guy or girl with the black hat. You have total freedom of constructing an initial network topology as long as all n nodes form a connected network and your topology respects the UDG constraints. You are also allowed to choose a source and destination pair for a message. Your goal is not to let the message reach its destination. How often do you have to move a node to achieve this goal? Or in other words: How many rounds can you sit still and let the message go on before you have to change the topology to prevent the message from arriving at its destination?

2 Pseudo-Geo-Routing with Anchor Nodes

We have seen in the lecture that geographic routing is also possible when nodes do not know about their absolute coordinates. Instead, virtual coordinates are derived from the hop-distance to a set of anchor nodes. Then, nodes use these virtual coordinates to pass a message to the neighbor which is closest to the destination.

a) We assume that in the first scenario each node is also an anchor node at the same time. Can you give an algorithm how to route messages along the shortest path?

b) Now we assume that the nodes form a ring topology. Open problem: Can you give a routing algorithm that works in this scenario? What is the minimal number of anchor nodes necessary?