

Homework III (due: 04/19/2010)  
CIS 9590 Ad Hoc Networks

Name \_\_\_\_\_ - Student Number \_\_\_\_\_

1. (Concepts)

- Explain the similarities and differences between *trust* and *reputation*. Use one or two examples to illustrate.
- Describe the notion of *wireless multicast advantage* and its use in power optimization in wireless networks.
- Discuss the similarities and differences between *area coverage* and *point coverage*. (Ref: J. Carle and D. Simplot-Ryl, IEEE Computer 2005.)

2. (Utility-based routing)

Consider a graph with four vertices:  $s, d, a, b$ . The edge set is  $\{(s, a, 1/0.7), (a, b, 1/0.95), (s, b, 4/0.9), (b, d, 3/0.8), (a, d, 3/0.9)\}$ , where  $(u, v, c/p)$  represents an edge connecting  $u$  and  $v$  with cost  $c$  and reliability  $p$ . Use Lu and Wu's utility-based routing to find the optimal path from  $s$  and  $d$  for (a) benefit being 10 and (b) benefit being 40.

(Ref: M. Lu and J. Wu, ICPP 2006 and J. Wu, M. Lu, and F. Li, ICDCS 2009.)

3. (Energy-efficient multicasting)

Given a geometric graph: 1: (12, 28), 2: (34, 49), 3: (8, 6), 4: (2, 45), 5: (40, 12), 6: (30, 20), 7: (25, 13), 8: (25, 30), 9: (1, 23), 10: (20, 26). Here  $u : (u_x, u_y)$  represents the coordinates of node  $u$  at axes  $x$  and  $y$ . We assume node 10 is the source. Find energy-efficient broadcast using (a) Least-Unicast-Cost (BLU), (b) Broadcast Link-based MST (BLiMST), (c) Broadcast Incremental Power (BLP) without sweep, and (d) BLP with sweep. It is assumed that the transmission cost is based on  $P(dis) = dis^2$ .

(Ref: J. Wieselthier, G. Nguyen, and A. Ephremides, INFOCOM 2000 and INFOCOM 2002.)

4. (Topology control)

For the example above, find minimal uniform transmission range using (a) Kruskals MST and (b) Prims MST starting from node 1.

(Ref: Q. Dai and J. Wu, Cluster Computing 2005 and R. Ramanathan and R. Rosales-Hain, INFOCOM 2000.)

5. (Sensor network coverage)

Given six points in a region [0:6, 0:6]: (1, 1), (2,4), (3,3), (3,1), (5, 2), (3, 5). Draw the corresponding Voronoi diagram and Delaunay triangles. Find the maximum breach path and maximum support path from (0, 0) to (6,6).

(Ref: S. Meguerdichian, INFOCOM 2001.)