Homework II (due: 03/19/2013)

CIS 9590 Ad Hoc Networks

Name ——————————————- Student Number ——————————————-

1. (Link reversal)

   - For a given directed graph with edge set $E = \{(m, r), (n, r), (v, m), (v, n), (w, n), (y, w), (x, w), (y, x), (y, z), (z, x)\}$, apply both full reversal and partial reversal. Assume node r is the root and link (n, r) is a broken link. Show all details including the number of rounds, the number of times nodes are involved in the reversal, and the number of times links are reversed. Note that (m, r) means a directed link from node m to node r.

2. (Connected dominating set)

   - For a given connected graph with edge set $E = \{12, 25, 27, 28, 34, 36, 38, 45, 58, 67, 78\}$, where 25 represents an undirected link between nodes 2 and 5, find out the CDS using (1) marking process only, (2) marking process plus Rules 1 and 2, (3) marking process plus Rule k, and (4) replacement path. For each case, consider two situations (a) each node has 2-hop information and (b) each node has 3-hop information. 12 represents an undirected link between nodes 1 and 2. All methods can be found at

     $http://www.cis.temple.edu/\ wu/research/publications/Publication\_files/TC0904.pdf$

     and its references [4] and [19] for extra information if needed.

3. (Clustering)

   - For a given connected graph with edge set $E = \{12, 15, 23, 26, 34, 36, 37, 48, 56, 67, 68\}$. Show details how clusterheads and cores are selected using the traditional clustering method and core extraction method. Here node id is used as the priority: the smaller the id the higher the priority. Both methods can be found at

     $http://www.cis.temple.edu/\ wu/research/publications/Publication\_files/rout3.pdf$

     and its references [10] and [25] for extra information if needed.

4. (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 MS T (BLiMST), (c) Broadcast Incremental Power (BLP) without sweep, (d) BLP with sweep, and (e) optimal solution using exhaustive enumeration. 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.)

5. (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.)