Homework II (due: 03/04/2015)

CIS 5636 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 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 $E = \{12, 25, 27, 28, 34, 36, 38, 45, 58, 67, 78\}$. 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 $http://www.cis.temple.edu/\sim wu/research/publications/Publication\_files/TC0904.pdf$ 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 $http://www.cis.temple.edu/\sim wu/research/publications/Publication\_files/rout3.pdf$ 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.)