Homework 4

Due on May 7th 2013

1. **DTN Routing** (C. Liu and J. Wu, Routing in a Cyclic MobiSpace, MobiHoc 2008) Consider a 4-node probabilistic time-space graph with a node set of {A, B, C, D} and a common motion cycle T=50. The corresponding time-space graph is given as follows for each pair of nodes: (A, B) ={ (5. 0.6), (20, 0.5) }, (B, C) = { (30, 0.8) }, (A, C) = { (0, 0.7) }, and (A, D) = { (10, 0.9) }. Determine the corresponding state-space graph (G'). Suppose the source is 20/D (the message is available at D at time unit 20). Find MDP of G' with B as destination. Finally, determine values and optimal actions after applying value iteration to the MDP of G'.

2. **Network Capacity** (X. Li, S. Tang and Ophir, Multicast Capacity for Large Scale Wireless Ad Hoc Networks, MobiCom 2007) What is multicast capacity? What are the differences between multicast capacity and broadcast/unicast capacity? What are area argument and data copies argument? Assume that there are n wireless nodes are randomly deployed in a square region with side-length a and all nodes have the uniform transmission range r, if a = 1000, r = 2, k= 5, how to calculate the asymptotic multicast capacity?

3. **Hybrid Network Capacity** (S. Tang etal, Closing the Gap in the Multicast Capacity of Hybrid Wireless Networks, MobiHoc 2012) A hybrid network is a random wireless network consisting of n randomly placed ordinary wireless nodes and m regularly placed base stations in a square region. What are three possible routing strategies in hybrid network? How to decide an appropriate routing strategy? If a = 1000, r = 2, k= 5, m = 100, how to calculate the asymptotic multicast capacity?

4. **Cognitive Radio Networks** (S. Li, Z, Zheng, E. Ekici, N. Shroff, Maximizing System Throughput by Cooperative Sensing in Cognitive Radio Networks, INFOCOM 2012) One of the main challenges in CRNs is the ability to accurately detect PU transmissions. Please briefly describe the advantage of CRN. Considering three identical SUs, the false alarm probability of each SU is 0.2 , midsection probability of each SU is 0.3, T_c=0.2, $\pi 0 = 0.5$, γ =0.9, if the observation vector is [010], how to decide the final sensing result in order to maximize the system throughput?