NJIT

IEEE North Jersey Communications Chapter

Effect of Node Noncooperation and Mobility on Mobile Infostation Networks

by **Wing Ho Andy Yuen**, WINLAB, Rutgers University

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Time: 6:00 pm (refreshment starts at 5:45 pm)
Place: 202 ECEC, NJIT

About the Speaker

Wing Ho Andy Yuen was born and raised in Hong Kong. He completed his bachelor degree in Electrical Engineering from Hong Kong University of Science and Technology and master degree in Information Engineering from the Chinese University of Hong Kong in 1995 and 1997 respectively.
Currently he is pursuing a Ph.D. degree in Electrical Engineering at the Rutgers University, and is expecting graduation any time soon. He is affiliated with WINLAB and his thesis advisor is Roy Yates. His research interest is on mobile ad hoc networks, including conventional multihop networks and a new paradigm called the mobile infostation networks. He is also interested in radio resource management and mobility management of mobile cellular networks. Recently, he starts working in the areas of pervasive computing, sensor networks and peer-to-peer computing. His work spans most layers of the network stack, from channeling modeling at the physical layer, to power control, rate adaptation, routing, network behavior, and to application layer such as designing auction algorithms. He is a regular reviewer of several journals and conferences, and is the primary author of more than a dozen refereed papers in conferences and journals.

About the Talk

In a mobile infostation network, any two nodes communicate when they are in proximity. Under this transmission constraint, any pair of nodes is intermittently connected as mobility shuffles the node locations.
In the first part of the talk, I address the issue of node noncooperation in mobile infostation networks in the context of a content distribution application. All nodes have common interest to all files cached in the fixed infostations. In addition to downloading files from the fixed infostations, nodes act as mobile infostations and exchange files when they are in proximity. We stipulate a social contract such that an exchange occurs only when each node can obtain something it wants from the exchange. We show hat network performance depends on the node density, mobility and the number of files that are being disseminated. Our results point to the existence of data diversity. The achievable throughput increases as the number of files of interest to all users increases. We have also extended the common interest model to the case where nodes have dissimilar interests. Simulation results show that as mobile nodes change from having identical interests to mutually exclusive interests, the network performance degrades dramatically. We propose an alternative user strategy when nodes have partially overlapping interests and show that network capacity can be significantly improved by exploiting multiuser diversity. We conclude that data diversity and multiuser diversity exist in noncooperative mobile infostation networks and can be exploited.
In the second part of the talk, I address the effect of node mobility on highway mobile infostation networks. Each node enters a highway segment at a Poisson rate with a random speed drawn from a known but arbitrary distribution. Since nodes have different speed, a node may overtake other nodes or be overtaken as time evolves. Using arguments from renewal reward theory, the long run fraction of time an observer node is connected, and the long run average data rate can be derived and are functions of the observer node speed. We consider both forward traffic scenarios, in which two nodes moving in the same direction have a transient connection when they are within range from each other, and reverse traffic scenarios in which two nodes travelling in opposite directions are connected transiently when they are in range. For node speed that is uniformly distributed, we reveal that the expected fraction of connection time, or expected number of connections in queuing terminology, is independent of the observer node speed in reverse traffic. In forward traffic, on the other hand, the fraction of connection time increases with observer speed. That is, network performance improves with node mobility, which is unique to mobile infostation networking paradigm.

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