1. Products of the Project

I received the Faculty Research Grant for the project titled “Adaptive MAC Protocols for Wireless Mesh Networks Using Directional Antennas” in March 2006. I was able to finish this project and have concluded it with some direct results and indirect results.

The direct results of this project include three manuscripts, one international workshop proposal, and one journal special issue proposal:

- Manuscript: Context-aware Rate Adaptation in IEEE 802.11 Wireless Mesh Networks (tentative title).
- Manuscript: Packet Scheduling with Buffer Management for Fair Bandwidth Sharing and Delay Differentiation.
- A graduate student Yujen Cheng has actively taken part in this project. He is working closely with me toward a manuscript: The Impact of Rate Adaptations on the QoS Support in IEEE 802.11e-based Wireless Networks (tentative title).
- One approved workshop proposal: The First International Workshop on Wireless Mesh and Ad Hoc Networks (WiMAN 2007).
- One approved journal special issue proposal: Computer Communications Journal (Elsevier), special issue on Wireless Mesh Networks.

The second manuscript has been submitted to a conference for publication, the first and the third manuscripts will be ready to submit soon. The WiMAN 2007 workshop will be held in conjunction with one the major networking conference – IEEE ICCCN 2007 in August 2007. The submission to the workshop has been closed and we have successfully attracted 74 submissions internationally. The journal special issue has a submission deadline set as August 31, 2007, and is expected to be published in spring/summer 2008.

This grant also helped to yield some indirect results, including one journal and two conference publications:

- A Novel Distributed Sensor Positioning System Using the Dual of Target Tracking (accept to appear in IEEE Transactions on Computers)
2. Description of Grant-Supported Activities
The focus of this project is primarily on the adaptive MAC design for Wireless Mesh Networks (WMNs). In my original proposal for this faculty research grant, I have planned to address the special challenge of exploiting directional antennas in WMNs. I started this project in summer 2006. During the first two months, I have built a realistic model for wireless nodes that are deployed with directional antennas, and conducted extensive simulation studies using ns-2 simulator to evaluate the pros and cons of using directional antennas. Interestingly, the benefit of using directional antennas was shown not as significant as I expected. So later on, I have shifted my focus toward wireless nodes that utilizing omni-directional antennas. For the rest of the summer, Fall 2006, and Spring 2007, I have been focus on two interesting problems related to wireless MAC protocols: (1) context-aware rate adaptation mechanisms, and (2) QoS-aware rate adaptation mechanisms. One of our graduate students – Yujen Cheng has actively taken part in the research on the second problem. Two manuscripts based on this effort will be ready to submit soon.

During the same time, my collaboration with a professor in University of Colorado at Colorado Spring also yielded some good result on packet scheduling for Internet services, this paper has been submitted to a conference for publication.

The Faculty Research Grant also made it possible for me to extend my previous work on sensor localization problem. This part of work has yielded 1 journal publication and two conference publications.

3. Acknowledgement
I am thankful to the grant and everyone related to the approval and management of this grant. I would also like to thank my colleagues in the Department of Computer and Information Sciences, for their support in applying this grant, and their help in my teaching so that I could have time to finish this project.