氏　　　　名	Chen Yin
学　位　名	博士（システム情報科学）
学位記番号	第２７号
学位授与年月日	平成２６年３月２４日
学位論文題目	Exact Throughput Capacity Studies for Mobile Ad Hoc Networks
論文審査委員	主査　姜　暁鴻
	副査　高橋　修
	副査　藤野　雄一
	副査　白鳥　則郎（早稲田大学 教授）

論　文　要　旨

・論文の構成

Chapter 1 Introduction
Chapter 2 Capacity and Delay-Throughput Tradeoff in ICMNs
Chapter 3 Throughput Capacity in ALOHA MANETs
Chapter 4 Throughput Analysis in MANETs with Directional Antennas
Chapter 5 Conclusion and Future Directions
Appendix A

・研究目的の妥当性，従来の手法との比較においての有意性，および理論・実験手法の新規性

This thesis studied the exact throughput capacity of three typical MANET scenarios in terms of their exact throughput capacity, a critical performance metric that is expected to provide precious insights to the design and optimization of future networks.

Most work on throughput capacity study only explored asymptotic bounds on the throughput capacity as network size scales, which tells us little about the actually achievable throughput a network can support. Different from previous studies, this thesis conducted research on exact throughput capacity of MANETs based on queuing theory and geometric analysis. Notice that available work on the exact throughput capacity study mainly focused on the cell-partitioned network with omnidirectional antennas, this thesis explored the exact throughput capacity of continuous MANETs and MANETs with directional antennas, making a nice complementation to the field of exact throughput capacity studies.

・得られた知見のシステム情報科学の分野における意義

The results of this thesis provide the following insights.

1. The novel analysis approach developed in this thesis could be helpful to explore the throughput capacity in other MANET scenarios as well.
2. The throughput capacity and optimization results developed in this thesis will provide important insights to network designers for performance improvement in MANET designs.

審査結果の要旨

This thesis studied the challenging problem of exact throughput capacity analysis for three promising MANET scenarios, namely intermittently connected mobility networks (ICMNs), ALOHA MANETs and MANETs with directional antennas. The thesis first studied the exact throughput capacity and delay-throughput tradeoff in ICMNs by employing queuing theoretical analysis. The thesis then extended the capacity study to ALOHA MANETs under nearest neighbor transmission and nearest receiver transmission, by first showing how the throughput capacity is determined by successful transmission probability (STP) and then using geometric analysis to develop efficient approximations to the STP and thus the throughput capacity. Finally, for MANETs with directional antenna, the thesis derived its maximum achievable throughput under a two hop relay algorithm, based on which throughput optimization was explored. All theoretical results were verified with extensive simulation results. It is expected that results developed in this thesis will be helpful for throughput capacity study in other MANET scenarios as well and can provide insights for network design and optimization in practice.