氏　名	SUMON KUMAR DEBNATH		
授与した学位	博　士		
専攻分野の名称	工　学		
学位授与番号	博甲第　　５８２２　　号		
学位授与の日付	平成３０年　９月２７日		
学位授与の要件	自然科学研究科　　産業創成工学専攻 （学位規則第４条第１項該当）		
学位論文の題目	Throughput Estimation Models under Various Conditions and MIMO Host Location Optimization Approach for Wireless Local-Area Network （無線 LAN における様々な条件下でのスループット推定モデルと MIMO ホスト配置の最適化手法）		
論文審査委員	教授　　舩曳　信生	教授　　田野　　哲	教授　　野上　保之

学位論文内容の要旨

In this thesis, first, to study the *throughput estimation model*, we present throughput measurement results of WLAN using IEEE 802.11n MIMO/SISO links under various conditions in indoor and outdoor environments. We consider two cases: 1) a single host communication with an AP at a time, and 2) concurrent communications of multiple hosts with a single AP at a time. Based on the throughput measurement results, secondly, we propose two modifications of the previous throughput estimation model, particularly to consider the concurrent communication of multiple hosts with one AP. Thirdly, we present the *MIMO host location optimization* approach as an extension of the active AP configuration algorithm in the elastic WLAN system. In this extension, MIMO host location are optimized by repeatedly exchanging the location of a randomly selected MIMO host with that of a SISO host for fixed times, if the result can satisfy the constraints of the network and improve the total throughput performance. Finally, we verify the effectiveness of the proposal through simulations in two network topologies using the *WIMNET simulator*. The CPU time to complete the proposed algorithm is also evaluated.

The remaining part of this thesis is organized as follows:
In Chapter 2, we briefly review related IEEE 802.11 wireless network technologies to this study, including the IEEE 802.11n/ac protocols, commercial APs, and software APs.
In Chapter 3, we provide the review of our previous related studies.
In Chapter 4, we present the throughput measurement results for IEEE 802.11n links under various conditions in indoor and outdoor environments, and extend the throughput estimation model by considering the concurrent communication of multiple hosts with a single AP.
In Chapter 5, we present the MIMO host location optimization approach as an extension of the active AP configuration algorithm in WLAN for improving the throughput performance.
In Chapter 6, we evaluate the MIMO host location optimization approach through extensive simulations in two network instances.
Finally, in Chapter 7, we conclude this thesis with some future works.

論文審査結果の要旨

In this thesis, he studies throughput estimation models under various conditions and the MIMO host location optimization approach for wireless local-area networks.

First, he presents throughput measurement results of WLAN under various conditions both in indoor and outdoor environments to study the throughput estimation model. In these measurements, he adopts commercial dedicated APs and software APs using Raspberry Pi for APs, and PCs with IEEE 802.11n MIMO and SISO links for user hosts. Here, he considers two cases: 1) a single host communicates with an AP at a time, and 2) multiple hosts communicate with a single AP at a time (concurrent communications). The results show that RSS (Receive Signal Strength) and the throughput of a host are strongly affected by the type of the AP or PC, the link distances, and the network environment. Then, based on throughput measurement results, he extends the previous throughput estimation model, particularly to consider the concurrent communications of multiple hosts. The comparisons of the estimated throughput and the measured one support the correctness of our proposal.

Next, he presents the extension of the active AP configuration algorithm to optimize the MIMO host location for the elastic WLAN system. In this extension, the MIMO host locations are optimized by repeatedly swapping the location of a SISO host and that of a MIMO host for fixed times, if the result satisfies the constraints for the network and improve the total throughput performance. The effectiveness of this proposal has been verified through simulations in two network topologies using the WIMNET simulator.

From the overall evaluation of this thesis, the applicant has satisfied the qualification condition for the doctor degree in Engineering from the Graduate School of Natural Science and Technology at Okayama University.