博　士　学　位　論　文

Doctoral Dissertation

内容の要旨

及び

審査結果の要旨

Dissertation Abstracts

and

Summaries of the Dissertation Review Results

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　博士の学位を授与したので、学位規則（昭和28年4月1日文部省令第9号）第8条の規定に基づき、その論文の内容の要旨及び論文審査の結果の要旨をここに公表する。

　学位記番号に付した「甲」は学位規則第4条第1項（いわゆる課程博士）によるものであることを示す。

Preface

　On granting the Doctoral Degree to the individuals mentioned below, abstracts of their theses and the theses review results are herewith publicly announced, in according to the provisions provided for in Article 8 of the Ruling of Degrees (Ministry Of Education Ordinance No.9, enacted on April 1, 1953)

　The Chinese character, "甲", at the beginning of the diploma number represents that an individual has been granted the degree in accordance with the provisions provided for in Paragraph 4-1 of the Ruling Of Degrees (what is called "Katei Hakase," or the Doctoral Degree granted by the University at which the grantee was enrolled.).

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Name 氏名	DONG, Mianxiong 董 冕雄 （ドン　ミエンション）
The relevant degree 学位の種類	Doctoral degree (in Computer Science and Engineering) 博士(コンピュータ理工学)
Number of the diploma of the Doctoral Degree 学位記番号	甲 CI 博第 38 号
The Date of Conferment 学位授与日	September 24, 2013 平成 25 年 9 月 24 日
Requirements for Degree Conferment 学位授与の要件	Please refer to the article five of "University Regulation on University Degrees" 会津大学学位規程　第5条該当
Dissertation Title 論文題目	ワイヤレスネットワークにおけるリソース管理とサービス提供のための効率的なアルゴリズムに関する研究 Efficient Algorithms for Resource Management and Service Provision in Wireless Networks
Dissertation Review Committee Members 論文審査委員	University of Aizu, Senior Associate Prof. GUO, Song. (Chief Referee) University of Aizu, Prof. MIYAZAKI, Toshiaki University of Aizu, Prof. TSUKAHARA, Tsuneo University of Aizu, Prof. COHEN, Michael Shanghai Jiao Tong University, Prof. GUO, Minyi. 会津大学上級准教授　ソン　グオ(主査) 会津大学教授　宮崎　敏明 会津大学教授　束原　恒夫 会津大学教授　マイケル　コーエン 上海交通大学教授　ミンイ　グオ

Abstract

Wireless Networks play an important role in our daily life due to the recent advances in low-power wireless communications and micro-electronics. To realize the ubiquitous society using these technologies, however, is still remaining important issues need to be addressed. Resource Management and Service Provision are the two important key words for wireless networks. In particularly, different from wired networks, energy and time consumption are always the crucial resource to maintain the wireless communication networks live longer. On the other hand, how to fully utilize the benefits of wireless infrastructure in terms of service provisioning is an ultimate goal which lots of researchers are pursuing. In this thesis, we try to address the above mentioned fundamental problems in various wireless network fields including Wireless Sensor and Actor Network (WSAN), Wireless Local Area Network (WLAN) Mesh Networks and Vehicular Ad Hoc Network (VANET) in order to benefit the quality of life with these deeply penetrated networks in our daily life. We first study the resource management problem in WSANs and WLAN Mesh Networks in chapter 3, chapter 4 and chapter 5. Then we address service provision challenges and solutions in VANET in chapter 6 and chapter 7.

To reduce the energy consumption in WSANs, we propose an efficient data collection scheme, called HARVEST to collect data with a Mobile Actor (MA). It is shown that the energy consumption of the WSANs can be reduced significantly while the efficiency of searching interests is maintained. Also, fast event detection is important in WSANs. We then propose a fast event detecting algorithm named RENDEZVOUS to accelerate the actor's event detecting process while keep the energy consumption of sensor nodes as minimum. Extensive simulation results demonstrate the proposed algorithm can achieve fast event detecting with neglect-able additional energy cost on sensors side. For the future wireless networks, it is anticipated that using more renewable energy sources in order to sustain the ever-growing traffic demands, while mitigating the effects of increased energy consumption. The objective our work is to determine the optimal placement of APs on a set of candidate locations such that the number of APs is minimized, subject to the constraints that QoS requirements of users can be fulfilled with the harvested energy. Extensive simulation results show that the proposed algorithm approaches the optimal solution under a variety of network settings with significantly reduced time complexity.

Providing real-time traffic information service in metropolises is desired since not only can it facilitate the traffic management but also save the time of travelers on road. However, to obtain the traffic information is extremely difficult due to the high cost of deploying a tremendously large number of sensors on every road segment or intersection. To overcome the challenge, we first extensively study the characteristics

of the measurement data of traffic information from over 5,000 operational taxies and buses in Shanghai, China. Utilizing the spatial correlation of traffic conditions, we propose a spatial-correlation based traffic estimation algorithm to successfully expand the coverage of vehicle sensors. Our experimental result shows that we can achieve estimation accuracy as high as 80% and 100% estimation coverage with the algorithm while the coverage of a pure heuristic estimation method is up to 65%, which demonstrates the significance of the proposed algorithm. Multi-media contents service for VANETs got a tremendous attention on recent year. Due to the distributed and highly dynamic nature of vehicular network, to minimize the end-to-end delay and the network traffic at the same time in data forwarding is very hard. Heuristic algorithms utilizing either contact-level or social-level scale of vehicular mobility have only one-sided view of the network and therefore are not optimal. By utilizing three large sets of GPS trace of more than ten thousand public vehicles, we propose an innovative scheme, named ZOOM, for fast opportunistic forwarding in vehicular networks. Extensive trace-driven simulations demonstrate the efficacy of ZOOM design. On average, ZOOM can improve 30% performance gain comparing to the state-of-art algorithms.

Summaries of the Dissertation Review Results

The committee members unanimously agree that the candidate passes his doctoral thesis final review.