

# Chung-Hua Chu

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## RESEARCH INTEREST

1. Multimedia applications on mobile phones such as iPhone, Android and Windows Mobile.
2. Mobile computing
3. Image processing techniques and multimedia applications
4. Secure protocols in 3G UMTS and 802.11 WLAN

## EDUCATION

Graduate Institute of Communication Engineering, National Taiwan University, Taipei, Taiwan

### Ph.D. 2008

Dissertation: "Effective Data Dissemination in Mobile Data Systems"

Department of Electrical Engineering, National Chung Hsing University, Taichung, Taiwan,

### M.S. 2004

Thesis: "A Secure Handoff Scheme for Integration of UMTS and 802.11 WLANs"

Department of Computer and Communication, National Kaoshiung First University of Science and Technology, Kaoshiung, Taiwan

### B.S. 2002

## PUBLICATIONS

### Journal Papers

1. C.-H. Chu and Y.-C. Ouyang, "Secure Data Transmission with Cloud Computing in Heterogeneous Wireless Networks", *Journal of Security Communication Networks* (SCI/EI, Impact Factor: 0.356, JCR 2010 Ranking in COMPUTER SCIENCE, INFORMATION SYSTEMS 115/128), accepted to appear in 2012.

2. C.-H. Chu, D.-N. Yang, Ya-Lan Pan, and M.-S. Chen, "Stabilization and Extraction of 2D Barcodes for Camera Phones," *ACM Multimedia System Journal*, Vol. 17, No. 2, pp. 113-133, March 2011. (SCI/EI, Impact Factor: 0.724 in 2009, Ranking in COMPUTER SCIENCE, INFORMATION SYSTEMS 88/116).

3. C.-H. Chu, H.-P. Hung and M.-S. Chen, "A General Framework of Time-variant Bandwidth Allocation in the Data Broadcasting Environment," *IEEE Transactions*

on *Knowledge and Data Engineering*, Vol. 22, No 3, pp. 318-333, March 2010, (SCI/EI, Impact Factor: 2.285 in 2009, Ranking in COMPUTER SCIENCE, INFORMATION SYSTEMS 20/116).

4. C.-H. Chu, "Super-Resolution Image Reconstruction for Mobile Devices", *ACM Multimedia System Journal*, a major revision in 2012, (SCI/EI, JCR 2010 Ranking in COMPUTER SCIENCE, INFORMATION SYSTEMS 88/116, Impact Factor: 1.176).

#### **Conference Papers**

5. C.-H. Chu, "Effective Spatial Data Broadcasting," Proceedings of IEEE Intern'l Conf. on Multimedia and Expo (ICME), July 9-13, 2012.

6. C.-H. Chu, M.-S. Chen, and Y.-F. Chen, "On the Energy Efficiency for Heterogeneous Data Broadcasting," *Proc. of the 10th International Conference on Mobile Data Management (MDM-09)* (acceptance rate < 26%), May 18-20, 2009 (EI).

7. C.-H. Chu, D.-N. Yang, and M.-S. Chen, "Multi-data Delivery Based on Network Coding in On-demand Broadcast," *Proc. of IEEE Intern'l Conf. on Mobile Data Management 2008 (MDM 2008)* (acceptance rate < 21%), 2008 (EI).

8. C.-H. Chu, D.-N. Yang, and M.-S. Chen, "Image Stabilization for 2D Barcode in Handheld Devices," *Proc. of the ACM Multimedia 2007* (a full paper, acceptance rate < 20% and a participation grant), September 23-29, 2007, Pages:697-706. (EI).

9. C.-H. Chu, D.-N. Yang, and M.-S. Chen, "Extracting Barcodes from a Camera-Shaken Image on Camera Phones," *Proceedings of IEEE Intern'l Conf. on Multimedia and Expo (ICME-07)*, July 2-5, 2007 (EI).

10. C.-H. Chu, H.-P. Hung and M.-S. Chen, "Variant Bandwidth Channel Allocation in the Data Broadcasting Environment," *Proc. of the 8th International Conference on Mobile Data Management (MDM-07)*, May 7-11, 2007 (EI).

11. C.-H. Chu, D.-N. Yang, and M.-S. Chen, "Using Network Coding for Dependent Data Broadcasting in a Mobile Environment," *Proceedings of IEEE GLOBECOM (GLOBECOM-07)*, Nov. 25-29, 2007 (EI).

12. Y.-H. Chang, C.-H. Chu, and M.-S. Chen, "A General Scheme for Extracting QR Code from a non-uniform background in Camera Phones and Applications," *IEEE International Symposium on Multimedia 2007 (ISM 2007)*, 2007 (acceptance rate < 25%) EI.

13. Y.-C. Ouyang and C. H. Chu, "A Secure Interworking Scheme for UMTS-WLAN," *IEEE Conference on Security and Privacy for Emerging Areas in Communication Networks (SecureComm05)*, 2005 (EI).

14. Y.-C. Ouyang and C.-H. Chu, "a security context transfer for integration of 802.11 WLAN and UMTS", *IEEE International Conference on Networking, Sensing and Control, (ICNSC 2004)*, 2004, Pages:559 - 564 (EI).

## HONORS

1. IBM student participation grant for ACM Multimedia 2007.
2. The best paper award of graduate student at National Chung Hsing University
3. A runner-up on the practical project contest of undergraduate student at National Kaoshiung First University of Science and Technology

## WORK AND TEACHING EXPERIENCES

### 1. Assistant Professor

Department of Multimedia Design, National Taichung University of Science and Technology, Taichung, Taiwan, R.O.C. (2009-present).

### 2. Research Assistant

A platform of networking services for multimedia sharing, NSC 95-2221-E-002-064 with Prof. Ming-Syan Chen, the Graduate Institute of Communication Engineering, National Taiwan University, 2007.

An advanced scheme for WLAN security, NSC 92-2213-E-005-101 with Prof. Yen-Chieh Ouyang, the Department of Electrical Engineering, National Chung Hsing University, 2003.

### 3. Teaching Assistant

High-speed communication network (2003f), video signal processing (2005f), system identity (2006s), wireless cross layer design (2006f), advanced wireless network (2006f), digital speech (2007s).

## RESEARCH EXPERIENCES

### 1. Stabilization and Extraction of 2D Barcodes for Camera Phones (6/2006–)

With the ubiquity of cellular phones, mobile applications with 2D barcodes have drawn a lot of attentions in recent years. When a user takes a barcode image with the camera in a mobile device, the captured image tends to be blurred due to camera shaking when the user presses the shutter. In addition, the captured image includes part of the complex background of the page with the barcode. We pointed out that the above two issues, which have not been identified in previous works, deteriorate the accuracy of barcode recognition. We then propose an efficient and effective algorithm to restore and extract 2D barcode from a complex background in a camera-shaken image. Compared with previous approaches, our algorithm outperforms in not only smaller running time but also higher accuracy of the barcode recognition. This work was accepted by *ACM Multimedia System Journal*, 2011.

### 2. Data Broadcasting (9/2004–)

Data broadcast is an advanced technique to realize large scalability and bandwidth utilization in a mobile computing environment. In this environment, the channel bandwidth of each channel is variant with time in real cases. However, traditional schemes do not consider time-variant bandwidth of each channel to schedule data items.

Therefore, the above drawback degrades the performance in generating broadcast programs. We addressed the problem of generating a broadcast program to disseminate data via multiple channels of time-variant bandwidth. In view of the characteristics of time-variant bandwidth, we propose an algorithm using adaptive allocation on time-variant bandwidth to generate the broadcast program to avoid the above drawback to minimize average waiting time. Experimental results show that our approach is able to generate the broadcast programs with high quality and is very efficient in a data broadcasting environment with the time-variant bandwidth. This work is accepted by *IEEE Transactions on Knowledge and Data Engineering*, March 2010.

In addition, we proposed a novel dynamic data broadcasting framework that adopts network coding with the stored data items in users. Our approach enables a server to dynamically encode multiple data items in each time slot, while each mobile user is able to retrieve the data item by decoding the encoded data items by using the locally stored data items. We proposed an algorithm to dynamically generate the broadcast program to minimize the average access time in the dynamic environment. Our algorithm can avoid encoding redundant data in each time slot to reduce the access delay. Simulation results show that our algorithm can reduce the access time by 52% as compared to the traditional scheme. This work was accepted by *IEEE Transactions on Mobile Computing*, with a minor revision.

### **3. A Handover Authentication Scheme for Integration of UMTS and 802.11 WLANs** (9/2002–6/2004)

We proposed a secure handoff scheme for the integration of UMTS and 802.11 WLAN networks. The handoff between 802.11 WLAN and the UMTS has some drawbacks and could be hijacked through middle of a communication session. An architecture built for a secure handoff scheme is proposed to fix that problem. The Dynamic Key Exchange Protocol (DKEP) is used to protect users during a UMTS handover to a 802.11 WLAN environment. The mobile station (MS) and access point (AP) compute their session key individually. The protocol includes three phases and all the steps of the phases are protected by public-key encryption. Therefore no information can be hijacked between MS and AP. From the security analysis, we know that the handoff between WLAN and UMTS is guaranteed in various aspects. For example, user identity and new registration can be protected, thus avoiding denial of service, key reuse, and so on. This work was accepted by *Journal of Security Communication Networks*.

#### **SKILLS**

**High-level languages:** Java J2ME, C, Objective-C 2.0, C#, C++, MFC, Visual Basic, .Net Framework.

**Assembly languages:** 80x86 Assembly, 8051 Assembly.

**Simulation software:** Matlab.

**Internet Programming:** HTML, CGI, Winsock.

**Linux Programming:** glib, Process control, Posix thread, network socket, device driver.

**Text editing software:** latex, Microsoft Office.

#### **COURSE TAKEN**

**Computer Science:** Artificial Intelligence, Financial Algorithm, Database System Design, Advanced multimedia analysis and indexing, Digital Image Processing, Data Structure, Digital Speech Signal Processing, Network Security, Graph Theory, Algorithm, etc.

**Communication Society:** Digital Communication, Information Theory, Network Queuing Theory, Random Process, Personal Mobile Communication System, Multimedia Network, High-speed Network, Detection and Estimation, Digital Signal Processing, Wireless Ad-hoc and Sensor Network, Computer and Network, etc.

**Electronic Society:** Electronics, VLSI Cell-based IC Design, Computer Structure, etc.

**Fundamental Mathematics:** Calculus, Linear Algebra, Probability, Differential Equation, Fourier Transformation, etc.

#### **ACADEMIC SERVICES**

##### **Program Committee:**

1. IEEE International Conference on Ultra Modern Telecommunication (ICUMT), 2009-2011.
2. International Conference on Computer Convergence Technology (ICCCT), 2011-2012.
3. IEEE International Conference on Cyber-Enabled Distributed Computing and Knowledge Discovery (CyberC), 2012.

##### **Reviewer:**

1. TKDE (IEEE Transactions on Knowledge and Data Engineering), 2006-2007
2. TMC (IEEE Transactions on Mobile Computing), 2009-2011
3. TPDS (IEEE Transactions on Parallel and Distributed Systems), 2010-2011
4. TMM (IEEE Transactions on Multimedia), 2011-2012
5. TWC (IEEE Transactions on Wireless Communication), 2011
6. VLDBJ (Very Large Data Bases Journal), 2006
7. Journal of Communications and Networks, 2010
8. Journal of Security Communication Networks, 2011
9. International Journal of Control, Automation, and Systems, 2010
10. ICDE (IEEE International Conf. on Data Engineering), 2006-2007
11. CIKM (ACM Conference on Information and Knowledge Management), 2006-2007
12. VLDB (International Conference on Very Large Data Bases), 2006

13. World Wide Web (WWW) Conference, 2006
14. MDM (Mobile Data Management), 2006-2008
15. GLOBECOM, 2006
16. ACM Multimedia, 2006
17. IEEE International Conference on Multimedia & Expo (ICME), 2006
18. IEEE Conference on Open Systems (ICOS), 2010-2011
19. IEEE International Conference on Computer Applications and Industrial Electronics (ICCAIE), 2010-2011
20. IEEE Symposium on Computers & Informatics (ISCI), 2011-2012
21. IEEE Asia Pacific Conference on Circuits and Systems, 2010
22. IEEE Symposium on Industrial Electronics and Applications (ISIEA), 2011
23. IEEE Symposium on Wireless Telecommunications Applications (ISWTA), 2011-2012
24. IEEE International Conference on Cyber-Enabled Distributed Computing and Knowledge Discovery (CyberC), 2011.
25. IEEE International Conference on Signal and Image Processing Applications (ICSIPA), 2011
26. IEEE International RF and Microwave Conference (RFM), 2011
27. IEEE Student Conference on Research and Development (SCORED), 2011
28. IEEE Business Engineering and Industrial Applications Colloquium (BEIAC), 2012
29. IEEE Applied Power Electronics Colloquium (IAPEC), 2012

**Invited Talks:**

1. “Effective Data Dissemination in Mobile Data System” , Intellectual Property Office, Ministry of Economic Affairs, Executive Yuan, Sep., 2010.
2. “Effective Data Dissemination in Mobile Data System” , National United University, Oct., 2011.

**Projects**

1. Efficient Network Coding for Data Broadcasting in a Mobile Environment, NSC100-2221-E-025-007, National Science Council, 2011/08/01~2012/07/31.

**Certifications**

1. Microsoft Office Specialist in Master, Microsoft Corporation, January 21, 2010.
2. Microsoft Office Specialist in Microsoft Office Excel 2003 Expert, Microsoft Corporation, January 21, 2010.

3. Microsoft Office Specialist in Microsoft Office PowerPoint 2003, Microsoft Corporation, January 21, 2010.
4. Microsoft Office Specialist in Microsoft Office Access 2003, Microsoft Corporation, January 21, 2010.
5. Microsoft Office Specialist in Microsoft Office Word 2003 Expert, Microsoft Corporation, January 21, 2010.
6. Computer Maintenance Class C, Certified #120014884, Council of Labor Affair, Executive Yuan, Taiwan, Republic of China, March 31, 1997

#### **REFERENCE**

Ming-Syan Chen, Ph.D. 886-2-33663572

Graduate Institute of Communication, National Taiwan University

Yen-Chieh Ouyang, Ph.D.

Department of Electrical Engineering, National Chung Hsing University

Latest update: 2012/03/03