行政院國家科學委員會專題研究計畫 成果報告

兼具高傳輸效率與容錯韌力之異質多層次多媒體群播服務(II)
研究成果報告(精簡版)

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執 行 單 位 ：國立交通大學資訊工程學系（所）

計 畫 主 持 人：邵家健
共 同 主 持 人：彭文孝、王忠炫
計畫參與人員：此計畫無其他參與人員

報 告 附 件 ：國外研究心得報告
赴大陸地區研究心得報告
出席國際會議研究心得報告及發表論文

處 理 方 式 ：本計畫可公開查詢

中 華 民 國 100 年 04 月 29 日

兼具高傳輸效率與容錯韌力之異質多層次多媒體群播服務

Transport Efficient and Loss Resilient Heterogeneous Multilayer Multimedia Multicasting

John K. Zao (NCTU), Wen-Hsiao Peng (NCTU), Chung-Hsuan Wang (NCTU) and Robert S.Y. Li (CUHK)

I. INTRODUCTION

This technical report described the results of on-going research on *heterogeneous multicasting of H.264 Scalable Video Bitstreams* performed by an NCTU project team consisting of Prof. John K. Zao (NCTU CS, PI), Prof. Wen-Hsiao Peng (NCTU CS, Co-PI), Prof. Chung-Hsuan Wang (NCTU EE, Co-PI) and Chair Prof. Robert S.Y. Li (CUHK IE, Adjunct-PI) supported by the NSC grant 98-2221-E-009-103.

Prof. John K. Zao (NCTU CS, PI) and Prof. Wen-Hsiao Peng (NCTU CS, Co-PI) began their collaborated research on SVC multicasting since early 2007. Their work was focused initially on the adaptation of SVC inter-layer dependence relations and bitstream extraction orders so as to attain rate-distortion optimized playback for different viewing devices. After receiving their first NSC grant, they invited Prof. Chung-Hsuan Wang (NCTU EE, Co-PI) and Chair Prof. Robert S.Y. Li (CUHK IE, Adjunct-PI) to join the project team and started exploring the benefit of employing unequal erasure correction and networking coding techniques to enhance the performance of SVC streaming over wireless LANs and the public Internet.

In the past four years, the project team has produced significant results in the following research topics. Only the underlined ones are summarized in this section. Reviewers are referred to the cited publication for details.

- Video Multicasting among Peers with Asymmetric Network Connectivity [1]
- Rate-Distortion Optimized SVC Interlayer Dependency and Bitstream Extraction [2, 3,4]
- Bandwidth Allocation for SVC Multipath Multicasting [5]
- Rate-Distortion Optimized RTP-based SVC Internet Streaming [6]
- Unequal Erasure Protection (UEP) of Scalable Video Multicasting using Randomized Linear Network Codes [7,8]
- Joint Source-Channel Coding for Rateless Unequal Erasure Protection of Wireless H.264 SVC Broadcasting [9]

II. VIDEO MULTICASTING AMONG PEERS WITH ASYMMETRIC NETWORK CONNECTIVITY

II.1 Objectives

Our first work on video multicasting tried to confront two issues that often arise when peer-to-peer application layer multicast (ALM) is used to provide video streaming to household users:

1. Peers with asymmetric connectivity for up/down links such as ADSL, VDSL or Cable modem usually have narrower upstream bandwidth. The capacity of peer's upstream bandwidth will influent on how many topological children it can support.
2. Peers, especially the mobile ones that use wireless links, may be disconnected from the network at any time, and thus cause the ALM services they render with unexpected performance degradation.

II.2 Approach

We devised a resilient application layer multicasting (ALM) mechanism, which has several desirable properties. (1) Peers can tolerate a small number of packet delay or loss and they still can receive complete message in time. (2) A sudden breakdown of some peers or links won't disrupt the reception of downstream peers. (3) Streaming data can be retrieved only by the peers subscribing to the ALM service, but not by the peers helping to provide the service.

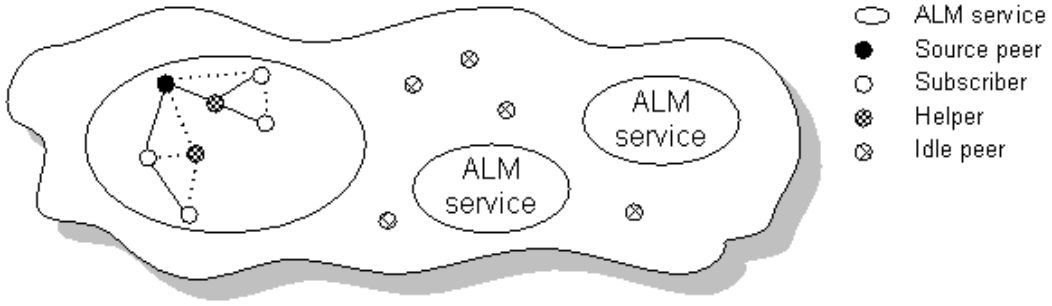


Figure 1 : Application Layer Multicast (ALM) System

We solve the asymmetric connectivity issue by making full use of peers' upstream bandwidth and increasing the total upstream bandwidth of the service. To reach the purpose we described, we use three approaches, which are described in the following paragraphs.

(A) Information Dispersion

Rabin's Information Dispersal Algorithm (IDA) is used to process the message generated from source peer and a message will be divided into several stripes. The peers can't know any content without receiving sufficient number of stripes. There are two meanings. First, it means you can't know any content of the message from one or few stripes. Therefore, if some peers have no authority to read the message, we only need to make sure not to let them receive too many different stripes of the message. Second, it means peers don't need to receive whole stripes of a message and they can still know the complete message. By this characteristic, we can improve the fault tolerance and robustness of data transmission.

(B) Multiple Path Transport

Each message transported from source peer that provide streaming data will be divided into several stripes. In the multicasting tree formation, we not only construct one tree, we construct as many different trees as the number of stripes that one message is divided into. And each tree transmits different stripe of the message. This approach will lead to two advantages. First, each stripe will pass through different path. When one peer leaves or crashed, descendants of the peer will only lose one stripes and they still can receive other stripes. Furthermore, when a hop of the path is congested, it only influences on the reception of one stripe. Second, a stripe is much smaller than a message. The advantage is that a peer with low upstream bandwidth can also support several children because the data it needs to retransmit is small enough. Therefore, every peer can fully utilize their upstream bandwidth.

(C) Helper Recruitment

Because the lack of upstream bandwidth, even we use multiple stripes approach to fully utilize every peer's upstream bandwidth; it is still possible that new peers cannot find the parent in the tree that can provide them smooth streaming data. Therefore, the service will request some peers called helper that still have unnecessary bandwidth to join and share their bandwidth to increase the total upstream

bandwidth of the service. With the aid of the helpers, the service can accept more peers and each peer can receive the streaming data smoothly.

II.3 Simulation Results

We combined the three approaches mentioned above and produced a new application layer multicast system[1] as shown in Figure 1. In an ALM system, there are many ALM services and each service provides different streaming data. Every ALM service uses information dispersal algorithm, multiple stripes, and helper approach to operate independently. Each user who joins the system is called a peer. The peer who provides streaming data is called source peer. The peer who wants to receive the streaming data of the service and join it is called subscriber in that service. And for other services, it is a helper. The peer who doesn't join any service of the ALM system is called idle peer. And the idle peer is also a helper for all services in the system.

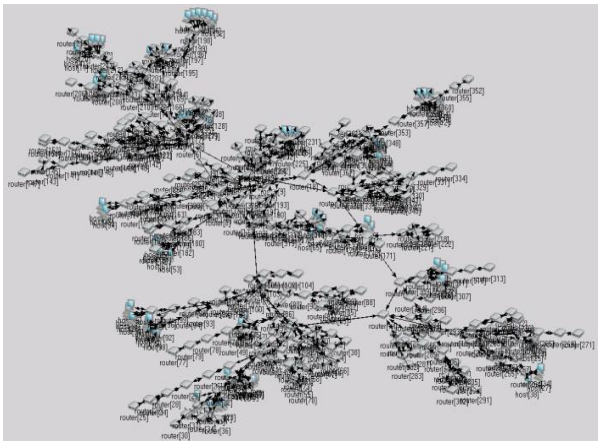


Figure 4: Network topology of *Trickle* simulations

III. RATE-DISTORTION OPTIMIZED RTP-BASED SVC INTERNET STREAMING

In this thesis [6], we aimed at building a rate-distortion estimation model. The expected rate and distortion can be calculated through our estimation model with a given packet loss rate and a transmission policy under certain transmission scenario.

Many details need to be tackled when streaming via RTP over the wired Internet are taken into account in our estimation model. This model is built for SVC video streaming under receiver-driven retransmission and receiver-driven aggressive retransmission.

The results show that the difference of RD points between different transmission policies become larger when the packet loss rate increase. As the maximum retransmission times increase, the improvement of distortion becomes less obvious.

We also propose transmission policy optimization algorithms. For a given bit rate, we can find the optimal transmission policy with minimum expected distortion through our optimization algorithms.

Figure 3: Recovered frame counts at the same two subscribers

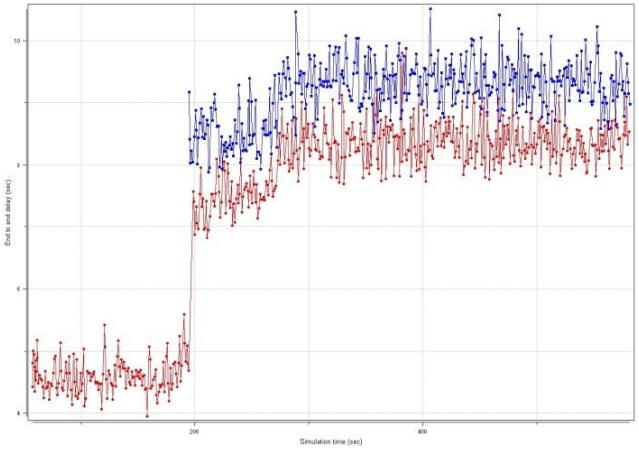
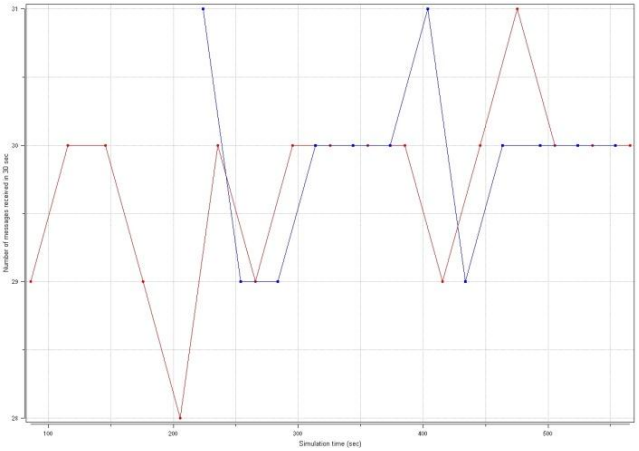


Figure 2: Packet latencies at two dispersed subscribers as more subscribers and helpers were introduced



III.1 Rate-distortion Estimation Model

In this research, our Rate-Distortion Estimation Model is based on Chou's model. First at all, we consider two kinds of retransmission mechanism.

- Receiver-driven Retransmission

[1] The ALM simulation network consists of 380 routers and 10(

The retransmission is controlled by receiver. When receiver wants to receive a multimedia data unit, receiver will send a request message to sender ask for the data unit. If in next time slot, receiver dose not receive the data unit, receiver will decide whether resend a request message to sender or not depends on the transmission policy.

- Receiver-driven Aggressive Retransmission

  The different with Receiver-driven Retransmission is that sender will send the data unit continuously until receiver sends an ACK message which represents receiver received the data unit.

- Rate-distortion Estimation

  Expected Distortion Value

$$D_{(L,T)}(\boldsymbol{\pi}) = D_0 - \sum_{\aleph_G(L',T')\in S(L,T)} \Delta D_{(L',T')} \prod_{\aleph_G(L'',T'')\preccurlyeq\aleph_G(L',T')} \left(1-\epsilon_{\pi(L'',T'')}\right) + \mathcal{C}_{(L,T)}$$

  Expected Transmission Cost Value

$$R_{(L,T)}(\boldsymbol{\pi}) = \sum_{\aleph_G(L',T')\in S(L,T)} \left(B_{(L',T')} + H\cdot N_{(L',T')}\right)\rho_{\pi(L',T')}$$

III.2 *Transmission Policy Optimization*

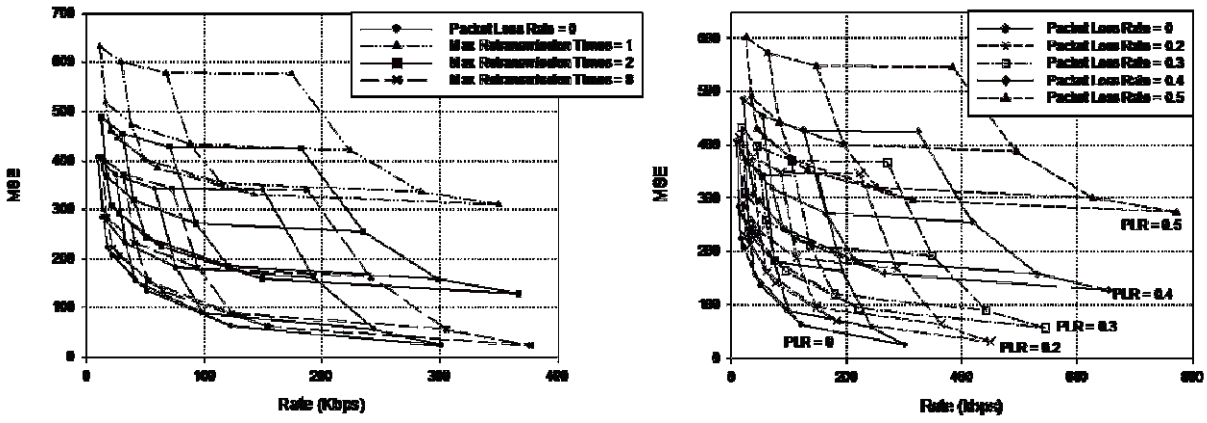
- Optimization Algorithm 1

  We used Greedy algorithm to find next possible policies according to extraction path. And then compute the expected rate and distortion choose the optimal improvement from these policies as our next policy. Find out the next policy step by step. Finally, we can get the optimized policy.

- Optimization Algorithm 2

  Algorithm 2 is also greedy but it did not take the extraction paths into account. When we tried to find the next policy, the algorithm will regard all possible policies as candidates even if some of them do not have any dependency with the data units that receiver has already received. Use this algorithm we find out another possible optimized solution.

III.3 Estimation Results



(a) (b)

Figure 5: (a) RD Trellis of Different Policies, Packet Loss Rate = 0.2 in Receiver-driven Retransmission. (b) Policy 1, Different Packet Loss Rate in Receiver-driven Aggressive Retransmission

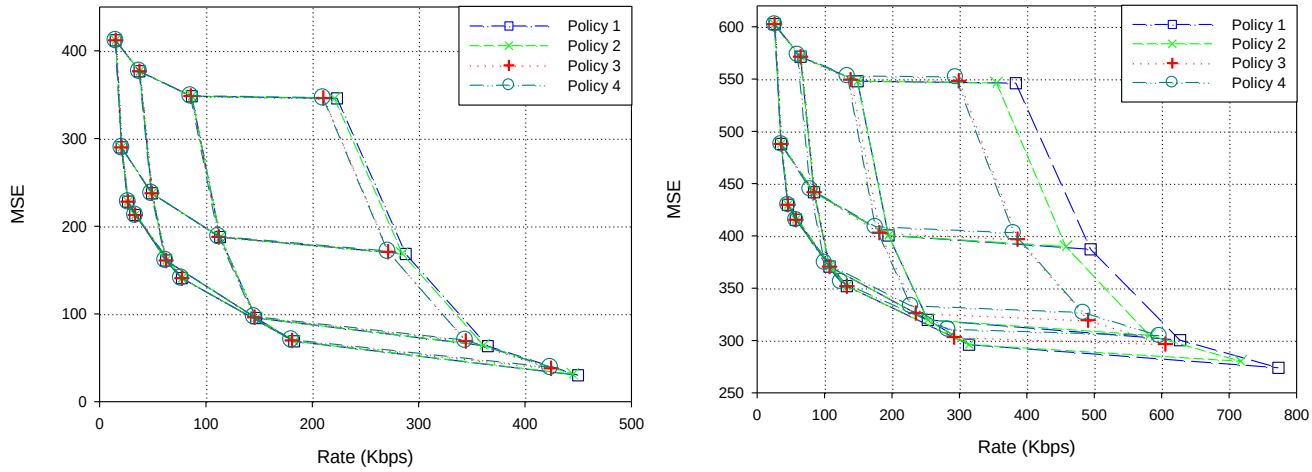


Figure 6: Different Policies, Different Packet Loss Rate in Receiver-driven Aggressive Retransmission

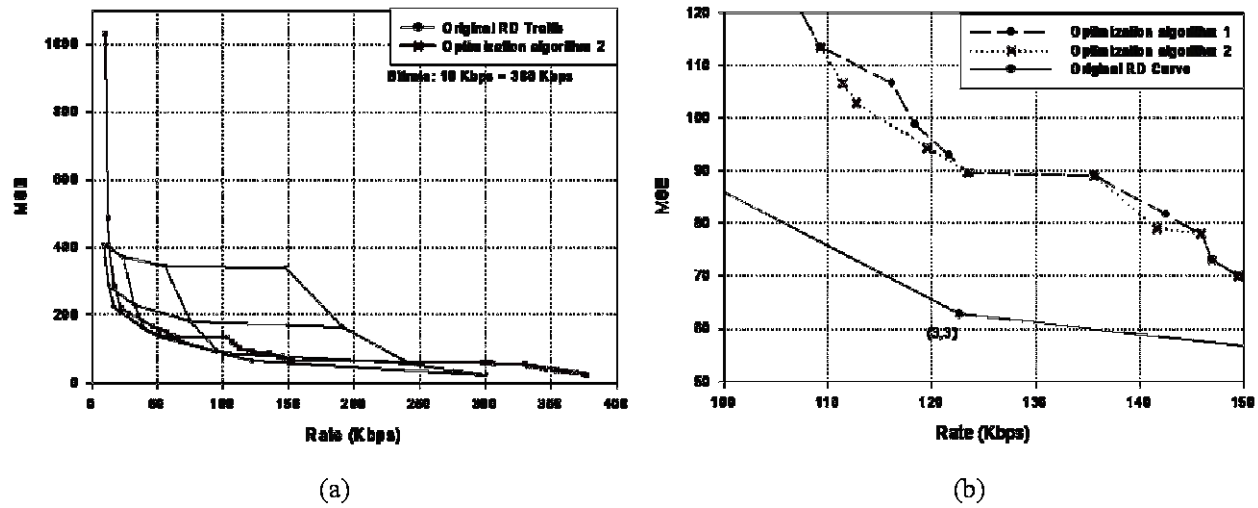


Figure 7: (a) Optimization Algorithm 2 RD Curve of optimal policies. (b) Compare Algorithm 1 to Algorithm 2 Min MSE at Different Bit Rate

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[1] Y. H. Guo, J. K. Zao, W. H. Peng, L. S. Huang, C. M. Lin, F. P. Kuo, "Trickle: Resilient Real-Time Video Multicasting for Dynamic Peers with Limited or Asymmetric Network Connectivity", *IEEE Int'l Symposium on Multimedia (ISM-2006)*, San Diego, U.S.A., December 11-13, 2006.

[2] W. H. Peng, L. S. Huang, J. K. Zao, J. S. Lu, T. W. Wang, H. T. Huang, and L. C. Kuo, "Rate-Distortion Optimized SVC Bitstream Extraction for Heterogeneous Devices : A Preliminary Investigation", *IEEE Int'l Symposium on Multimedia (ISM-2007)*,2007.

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[6] C. C. Hu, J. K. Zao, "Rate-Distortion Optimization of H.264 SVC Internet Streaming via RTP with Receiver-driven Retransmission". *NCTU MS Thesis*, 2008.

[7] J. K. Zao, Q. T. Sun, K. K. Yen, S. Y. R. Li, C. H. Wang, C. Yao, T. Liang, N. A. Claude, J. Yip. "On Optimal Unequal Error/Erasure Protection (UEP) of Scalable Video Multicasting using Randomized Linear Network Codes". *IEEE Int'l Symposium in Network Coding (NetCod-2011)*, Beijing, China, July 25–27, 2011.

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[9] J. K. Zao, C. H. Wang, W. H. Peng, H. M. Chen, C. M. Chiu, T. C. Shen, P. L. Diao, P. W. Wang. "Joint Source Channel Coding for Rateless Unequal Erasure Protection of Wireless H.264 SVC Broadcasting". *IEEE Int'l Conference on Visual Communication and Image Processing (VCIP 2011)*, Tainan, Taiwan, November 6–9, 2011.

國科會補助專題研究計畫項下赴國外出差或研習心得報告

日期：100 年 03 月 31 日

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出國人員 姓名	邵家健 John K. Zao	服務機構 及職稱	國立交通大學資訊工程系
出國時間	99 年 7 月 11 日至 99 年 7 月 12 日	出國地點	Institut für Nachrichtentechnik, RWTH, Aachen, Germany

一、 國外研究過程

Prof. John K. Zao was invited to pay a visit to Prof. Jens-Rainer Ohm ohm@ient.rwth-aachen.de of Institut für Nachrichtentechnik, RWTH, Aachen [cf. attached email messages] as a collaborator and the graduate advisor of summer internship student, Mr. Chih-Ming Chiu (邱志明). The following schedules of a two-day visit (as a detour from Frankfurt after attending the Microsoft Imagine Cup Final in Warsaw, Poland) provided a brief and yet valuable chance to interact with a world-renowned multimedia research team.

7/11 (Sun)	Schedules	Activities
	2PM (14:00) - 4PM (16:00)	Warsaw -> Frankfurt
	5PM (17:00) – 10PM (18:00)	Frankfurt -> Aachen
	Night	Stay in Aachen
7/12 (Mon)	Schedules	Activities
	9AM (09:00) – 11AM (11:00)	Meeting with Chih-Ming Chiu and his colleagues
	11AM (11:00) – 12NN (12:00)	Meeting with Prof. Ohm
	12NN (12:00) – 1PM (13:00)	Lunch with Chih-Ming Chiu and his colleagues
	1PM (13:00) - 6PM (18:00)	Aachen -> Frankfurt
	7:45PM (19:45)	Frankfurt -> Hong Kong

二、 研究成果

Meetings with Prof. Ohm, his colleague (Dr. Mathias Wien) and PhD students (Bing Zhang) have proven to be most fruitful. Not only we learned of their most recent work on High Efficiency Video Coding (HEVC) but also started co-working relation with Mr. Bing Zhang. My student, Chih-Ming Chiu (邱志明), has been following up this line of work.

John K. Zao (NCTU CS)

From: John K Zao (CS NCTU, Tw) <jkzao@cs.nctu.edu.tw>
Sent: Thursday, July 08, 2010 9:40 PM
To: 'Jens-Rainer Ohm'
Cc: 'cmchiu213@gmail.com'; 'Bin Zhang'; 'Wen-Hsiao Peng'; 'Mathias Wien'; 'klein@ient.rwth-aachen.de'
Subject: Tentative plan of my visit

Dear Prof. Ohm:

THANK YOU SO MUCH for your reply! I'm SORRY to bother you while you must be busy preparing for the upcoming H.265 Standard Meeting.

If possible, I would like to have a short meeting with you at 11AM on Monday (7/12) as you suggested. We can discuss research issues of our common interests, especially those of heterogeneous multicasting using H.264 SVC and UEP Coding. Before or after our meeting, I hope to meet with Bin Zhang, Chih-Ming Chiu as well as others who are interested in those research issues.

I plan to arrive at Aachen in Sunday evening and leave on Monday or Tuesday afternoon. Chih-Ming and Bin are helping me to make the necessary travel and lodging arrangements.

THANK YOU for agreeing to receiving me in short notice! Look forward to meeting with you on Monday!

With warm regards,

John K. Zao

From: Jens-Rainer Ohm [mailto:ohm@ient.rwth-aachen.de]
Sent: Thursday, July 08, 2010 12:06 PM
To: jkzao@cs.nctu.edu.tw
Cc: '???'; cmchiu213@gmail.com; 'Wen-Hsiao Peng'; 'Mathias Wien'; klein@ient.rwth-aachen.de
Subject: RE: Regarding your summer intern student, Mr. Chih-Ming Chiu.

Hi Prof. Zao,

Next week, the best possibility for me would be on Friday 16th. Otherwise, I could reserve only a short time slot Monday 12th between 11 and 12.

Best regards,
Jens Ohm

From: John K Zao (CS NCTU, Tw) [mailto:jkzao@cs.nctu.edu.tw]
Sent: Saturday, July 03, 2010 1:27 AM
To: ohm@ient.rwth-aachen.de
Cc: '???'; cmchiu213@gmail.com; 'Wen-Hsiao Peng'; jkzao@cs.nctu.edu.tw
Subject: Regarding your summer intern student, Mr. Chih-Ming Chiu.

Greetings, Prof. Ohm.

My name is John Zao. I am a faculty member of the National Chiao-Tung University (NCTU) in Taiwan, who is the research advisor of your summer intern student, Mr. Chih-Ming Chiu, and a collaborator with Prof. Wen-Hsiao Peng and Prof. Hsueh-Ming Hang.

I am so glad that Chih-Ming will have the chance of working in your lab during this summer. His thesis work is on the Joint Design of Error-resilient H.264 SVC Coding and Rateless UEP Channel Coding for Wireless Video Broadcasting. I am sure Chih-Ming will benefit a lot from his internship in your lab.

I wonder whether it would be possible at all for me to pay a visit to you while Chih-Ming is working in your lab. I'm currently in Warsaw (Poland) with my students who will participate in the Microsoft Imagine Cup competition. Since I'll travel through Frankfurt on my return trip, I would like to explore the possibility of making a detour to Aachen and pay you and your team a brief visit in the week of July 12th.

SORRY for being an invited guest! However, I do hope to cultivate some form of collaboration between our research teams. Would you kindly advise me whether you would be available in that week and whether my intended visit might be feasible? All my travel expenses will be covered by my own research grant and I am planning for a brief stay in Aachen.

Look forward to hearing from you.

Sincerely,

John K. Zao (趙金雄), PhD (Harvard) SMIEEE
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國科會補助專題研究計畫項下赴大陸地區出差或研習心得報告

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出國人員 姓名	邵家健 John K. Zao	服務機構 及職稱	國立交通大學資訊工程系
出國時間	99 年 3 月 25 日至 99 年 3 月 26 日	出國地點	香港 中文大學 (CUHK)

一、 大陸研究過程

香港中文大學李碩彥講座教授是本計畫的協同主持人，其主持的香港中文大學網路編碼與信息研究中心亦為本計畫的資助來源之一。李講座教授為「網路編碼」的共同發明人，在線性網路編碼、蝴蝶網路、卷積網路編碼等方面做了原創性的工作，與合作者楊偉豪教授、蔡甯教授發表在 IEEE 資訊理論匯刊上的論文“Linear Network Coding”獲得了 IEEE 資訊理論協會 2005 年度論文獎。這是三十餘年來亞洲研究人員首次獲得此榮譽。李教授極有興趣將目前「具有不同錯誤消除能力的多來源的隨機編碼」的理論與我們合作，進行技術發展，期望不管是在理論或是實務上，都能夠有合作加乘的成效。

Prof. John K. Zao and his co-advised PhD student, Mr. Kuo-Kuang Yen (顏國光),were invited by Prof. Shu-Yen Robert Li (李碩彥講座教授) to visit CUHK Institute of Network Coding (INC) and discuss the prospect of developing Randomized Linear Network Codes (RLNCs) with Unequal Error/Erasure Protection (UEP) capability. The invitation letter was attached below.

Mr. Yen was also invited to stay and work as a full-time research assistant (RA) in the institute.

二、 研究成果

During this visit, Prof. Zao gave a talk on “Scalable Video (SVC) Multicasting Using UEP Randomized Linear Network Codes (RLNCs)” at the CUHK-INC. The talk was followed by a series of intensive discussions of potential collaboration.

The two papers published at the *NetCod 2011* conference in July 2011 are the direct products of the collaboration.

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Ref: SYL0510

March 24, 2010

Prof. Zao Kar Kin
CSIE Department, National Chiao Tung University
1001 University Road, Hsinchu, Taiwan 300, ROC

Dear Prof. Zao,

It is my great pleasure to invite you to visit Department of Information Engineering, The Chinese University of Hong Kong from March 25, 2010 to March 26, 2010. During this period, you will join the "New Directions in Network Coding" research project. I sincerely hope that you would accept this invitation and trust that your expertise will contribute significantly towards this visit.

Best regards

Professor S.Y. Li
Professor of Information Engineering Dept.
The Chinese University of Hong Kong

國科會補助專題研究計畫項下出席國際學術會議心得報告

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出國人員 姓名	邵家健 John K. Zao	服務機構 及職稱	國立交通大學資訊工程系
會議時間	99 年 8 月 31 日 至 99 年 9 月 4 日	會議地點	Buenos Aires, Argentina
會議名稱	The 32nd Annual International Conference of IEEE Engineering in Medicine and Biology Society (EMBC 2010)		
發表論文 題目	Consistent Sparse Representations of EEG ERP and ICA Components Based on Wavelet and Chirplet Dictionaries		

< 附註 >

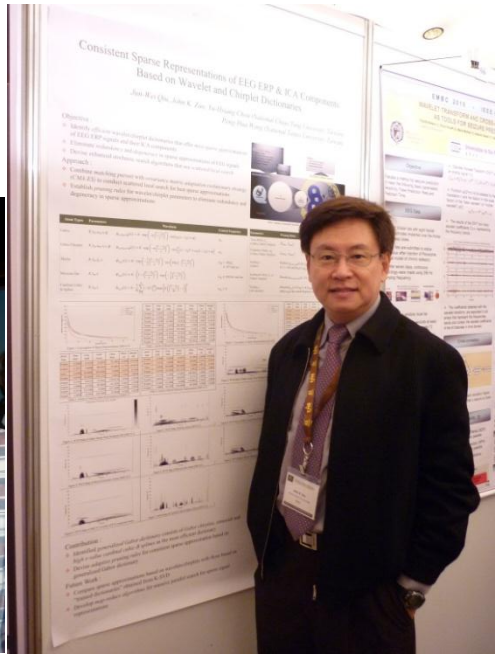
此次參加會議的支出由國科會生物處醫療器材產業藍圖發展計畫所支付。在此說明的原因為之前有在此計畫中提出本案的預算，但實際上並沒有從此計畫支出。

一、參加會議經過

Prof. John K. Zao was invited to attend the flagship conference of IEEE Engineering in Medicine and Biology Society (EMBS) as the corresponding author of the published paper. The official invitations were included in this report as Attachment #2. The certificate of attendance was included as Attachment #1. Prof. Tzyy-Ping Jung (UCSD) and Mr. Chun-Shu Wei (NCTU, BRC) were in his company at the conference [photo, below left]. During the conference, Prof. Zao attended the activities listed in the attached program sheet [Attachment #3]. In addition, he also attended the "Engineering Global Health" workshop on September 1, 2010. Prof. Zao presented his paper in the morning of Friday (September 3rd) at the poster session [photo, below right]. He returned from the conference on the following day, September 4.

二、與會心得

The exchanges of opinions at the poster sessions and the "Engineering Global Health" workshop were most informative and fruitful. A lot of insight was also gathered by listening to the keynote speeches.



三、考察參觀活動 (無是項活動者略)

四、建議 (略)

五、攜回資料名稱及內容 (略)

六、其他 (略)

Dear John K. Zao,

You are cordially invited to join us at the 32nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBC2010. This prestigious event, the world's largest annual Biomedical Engineering forum, to be held in Buenos Aires, Argentina from August 31- September 4, 2010 http://embc2010.embs.org.

The theme of EMBC2010, "Merging Medical Humanism and Technology." covers a broad spectrum of topics, from engineering and physical sciences to medical and clinical applications. Acceptance of your paper for presentation does not, in any way, financially obligate either EMBC2010 or the IEEE Engineering in Medicine and Biology Society (EMBS) for the expenses you incur for travel and conference attendance, and all conference participants are expected to pay the registration fees according to conference policy.

We would like to extend you a cordial invitation to join us in this prestigious event should your time and schedule permit. Detailed information regarding the conference can be found at the Conference website, embc2010.embs.org.We look forward to your participation in EMBC 2010 and welcoming you in Buenos Aires!

Sincerely yours,

Jorge E. Monzon, PhD
Program Chair

Ricardo L. Armentano
Conference Chair

James L. Patton
Program Co-Chair

Donna Hudson
Conference Co-Chair

IEEE EMB
IEEE Engineering in Medicine and Biology Society

John Kar-Kin Zao's Program for EMBC'10

*Final version not received Compiled on September 1, 2010

Day	Time	Paper Title or Activity	Authors	Session	Room
Wednesday, September 1, 2010	17:30-19:00	Engineering Global Health* WeE14.1	Paul LaBarre	Engineering Global Health – WeE14	Auditorium
	18:00-18:15	Arousing Feedback Rectifies Lapse in Performance and Corresponding EEG Power Spectrum WeE12.3	Tzyy-Ping Jung, Kuan-Chih Huang, Chun-Hsiang Chuang, Chien-Ann Chen, Li-Wei Ko, Tzai-Wen Chiu, Chin-Teng Lin	Minisymposium on Impaired Attention: Drowsiness and Microsleeps – WeE12	Rio de Plata
	20:30-21:00	Science and Peace* WeK3L1.1	Roberto Favaloro	Science and Peace – WeK3L1	Libertado ABC
Thursday, September 2, 2010	17:30-19:00	Dealing with nonstationarities in biomedical signals: Advanced methods and applications* ThS2M1.1	Patrick Flandrin	Dealing with Nonstationarities in Biomedical Signals: Advanced Methods and Applications – ThS2M1	Aguila
Friday, September 3, 2010	10:45-12:15	Nonlinear Analysis of Movement-Related Changes in Human Subthalamic Local Field Potentials FrBPo09.5	Chun-Shu Wei, Chon-Haw Tsai, Shang-Ming Chiou, Yi-Ting Hseu, Ta-Wei Liu, Hsin-Yi Lai, Ting-Fang Chien, Yi-Hsuan Kuo, Wan-Ting Zhao, Yu-Shun Tang, Sheng-Yuan Su, You-Yin Chen	Analysis of Neural Signals III – FrBPo09	Catalinas/Golden Horn
	10:45-12:15	Wavelet Transform and Cross-Correlation As Tools for Seizure Prediction FrBPo05.6	Claudia Cristina Botero, Eric Talamoni Fonoff, Antônio Carlos Godoi, Gerson Ballester, Francisco Javier Ramirez-Fernández, Mario Munoz	Eeg II – FrBPo05	Catalinas/Golden Horn
	10:45-12:15	Consistent Sparse Representations of EEG ERP and ICA Components Based on Wavelet and Chirplet Dictionaries FrBPo05.5	Jun-Wei Qiu, John Kar-Kin Zao, Peng-Hua Wang, Yu-Hsiang Chou	Eeg II – FrBPo05	Catalinas/Golden Horn
	10:45-12:15	Reduction of Irrelevant and Redundant Data from TFRs for EEG Signal Classification FrBPo05.4	Luis David Avendaño-Valencia, J.D. Martínez-Vargas, Eduardo Giraldo, Germán Castellanos-Dominguez	Eeg II – FrBPo05	Catalinas/Golden Horn
	10:45-12:15	Feature Analysis of Epileptic EEG Using Nonlinear Prediction Method FrBPo05.1	Qingfang Meng, Weidong Zhou	Eeg II – FrBPo05	Catalinas/Golden Horn
	13:15-14:15	Multi-wave Imaging* FrPLXL1.1	Mathias Fink	Multi-Wave Imaging – FrPLXL1	Libertado ABC
	14:30-14:45	Estimation of Alertness Levels with Changes in Decibel Scale Wavelength of EEG During Dual-Task Simulation of Auditory Sonar Target Detection FrC11.1	Sridhar Poosapadi Arjunan, Dinesh Kant Kumar, Tzyy-Ping Jung	Impaired Attention: Drowsiness and Microsleeps – FrC11	Poncho
	15:45-16:00	Wireless Physiological Monitoring and Ocular Tracking: 3D Calibration In a Fully-Immersive Virtual Health Care Environment FrC11.6	Lelin Zhang, Yu Chi, Eve Edelstein, Jurgen Schulze, Klaus Gramann, Alvaro Velasquez, Gert Cauwenberghs, Eduardo Macagno	Impaired Attention: Drowsiness and Microsleeps – FrC11	Poncho

國科會補助計畫衍生研發成果推廣資料表

日期:2011/04/28

國科會補助計畫	計畫名稱: 兼具高傳輸效率與容錯韌力之異質多層次多媒體群播服務(II)
	計畫主持人: 邵家健
	計畫編號: 98-2221-E-009-103- 學門領域: 計算機網路與網際網路

無研發成果推廣資料

98 年度專題研究計畫研究成果彙整表

計畫主持人：邵家健	計畫編號：98-2221-E-009-103-
計畫名稱：兼具高傳輸效率與容錯韌力之異質多層次多媒體群播服務(II)	

成果項目			量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）
			實際已達成數（被接受或已發表）	預期總達成數(含實際已達成數)	本計畫實際貢獻百分比		
國內	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%		
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（本國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		
國外	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	3	3	100%		
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（外國籍）	碩士生	6	6	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		

其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)	無

	成果項目	量化	名稱或內容性質簡述
科教處計畫加填項目	測驗工具(含質性與量性)	0	
	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與（閱聽）人數	0	

國科會補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

■達成目標

□未達成目標（請說明，以 100 字為限）

□實驗失敗

□因故實驗中斷

□其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文：■已發表 □未發表之文稿 □撰寫中 □無

專利：□已獲得 □申請中 ■無

技轉：□已技轉 □洽談中 ■無

其他：(以 100 字為限)

詳細資料請參考下一段。

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）(以 500 字為限)

自 2008 年夏，本團隊從網際網路、視訊壓縮、通道/網路編碼等方面着手研發兼具高傳輸效率與容錯韌力之異質 H.264-SVC 群播服務。在這次研究計畫中，我們致力加強 H.264 - SVC 之優雅降解 (graceful degradation) 能力。本計劃旨在實現以下三個目標：

1. 發展一種特別為 H.264 - SVC 視訊串流而設計之短訊息 rateless 非均等抹除糾正（UEP）編碼，並用之以優化 H.264-SVC 在無線區域網或城域網內進行視訊群播時的優雅降解能力；

2. 發展一種具有非均等錯誤糾正之隨機線性網絡編碼(RLNC)，以期能克服當熱門網站突然出現大量流量時，進而造成公眾網路上壅塞的狀況；

3. 發展一套演算法來決定如何最佳或近乎最佳地分配 MGS 編碼，使 SVC-MGS 視訊串流得以和 rateless 非均等抹除糾正編碼或網絡編碼搭配，並且可達到近乎最佳的傳輸效益和畫面品質。

我們發表了三篇會議論文在不同的國際學術會議上，分別是在網路編碼及視訊編碼(Network Coding)及傳輸(Scalable Video Coding and Transport)的領域。