CODESWAN

"COAT"NET

CODESWAN/COATNET-2 Joint Steering Committee Meeting

Kyoto University, 26-27 March 2012

(Final Program)

- COperative DEcision Making based on Slepian-Wolf/multiple Access wireless Network –
- COnnect All by Turbo NETworks-2 (COATNET-2) -

Date: March 26-27

Venue: Conference Room, Graduate School of Informatics, Kyoto University
http://www.kyoto-u.ac.jp/ja/access/campus/map6r_y.htm
The meeting place is in buildings 67, but its enterance is difficult to find. Follow the information presented on the stand map set up in front of building 63.

Program:

March 25 (*evening*): Friendly Gathering (unofficial)

March 26: Technical Sessions

10:00 *Welcome* *Prof. Tad Matsumoto* (JAIST)

10:10-10:30 *About the Projects, Expectations for the STC Members*
Prof. Tad Matsumoto (JAIST)

10:30-11:00 *Effect of Convolutional Code Choice on Turbo Equalization with Faster-than-Nyquist Signaling*
Mr. Mirza Golam Kibria (Kyoto University)

11:00-11:30 *Joint Channel-and-Network Coding Using EXIT Chart Aided Relay Activation*
Prof. Shinsuke Ibi (Osaka University)

(Lunch Break)

13:00-13:30 *Distributed coding for non-binary correlated sources*
Prof. Motohiko Isaka (Kwansei Gakuin University)

13:30-14:00 *On the Duality of Source and Channel Correlation: Slepian-Wolf Relaying Viewpoint*
Prof. Tad Matsumoto (JAIST)

14:00-14:30 *Distributed Joint Source-Channel Coding for Relay Systems Exploiting Source-Relay Correlation and Source Memory*
Mr. Xiaobo Xhou (JAIST)

14:30-15:00 *Research Plan: Wireless GREAT-CEO*
Mr. Xin He (JAIST)

(Break)

15:30-16:00 *Very Low Rate BICM-ID based IDMA*
Mr. Ormsub Soulisak (JAIST)

16:00-16:30 *A Multiple Access Relay Allowing Intra-Link Errors*
Mr. Pen Shun Lu (JAIST and University of Oulu)

16:30-17:00 *Iterative Spatial Demapping for Two Correlated Sources over Fading Multiple Access Channel*
Prof. Khoirul Anwar (JAIST)

March 27: Technical Sessions

9:20 Reunification

9:30-10:00 *Cooperative Wireless Network Coding for Uplink Transmission on Hierarchical Wireless Networks*
Prof. Alister Burr (York University)
Prof. Jan Sykora (Czech Technical University in Prague)

10:00-10:30 *DIWINE - Dense Cooperative Wireless Cloud Network*
Prof. Jan Sykora (Czech Technical University in Prague)

10:30-11:00 *Radio Reseouce Management with Coordinated Multipoint Processing and Relaying*
Prof. Markku Juntti (University of Oulu)

11:00-11:30 *Real-Time Low Power Wireless System Design and Implementation Methodology*
Prof. Trio Adiono (Bandung Institute of Technology)

(Lunch Break)

Management Session

13:00-15:00 *Evaluation of Project Scope, Goals, and Directions*
Evaluation of 2011 Results
Comments/Suggestions towards 2012 and 2013
AoB
(*STC Members, Prof. Matsumoto, Prof. Murata, Prof. Ibi, Prof. Isaka, and Prof. Khoirul Anwar*)

15:00-16:30 *Kyoto University Campus Tour,*
Led by Prof. Hidekazu Murata (Kyoto University)

Social Events

March 25 (*evening*): Unofficial Friendly Gathering

Expected Participants: *Prof. Alister Burr, Prof. Jan Sykora, Prof. Trio Adiono, Prof. Tad Matsumoto* (Participation to be decided: *Prof. Khoirul Anwar*)

Gathering: *Since Prof. Jan Sykor, and Prof. Trio Adiono are staying in the same hotel, Royal Park Hotel The Kyoto, participants should meet at the Lobby of the hotel at 18:00. The project budget does not cover the cost for this event, because it is an unofficial part of the meeting.*
Place: TBD. *Let's decide on site!*

March 27 (*evening*): Official Banquet

Expected Participants: *Prof. Markku Juntti, Prof. Alister Burr, Prof. Jan Sykora, Prof. Trio Adiono, Prof. Tad Matsumoto, and Prof. Khoirul Anwar, Prof. Hidekazu Murata, Prof. Motohiko Isaka, Prof. Shinsuke Ibi, Mr. Xiaobo Xhou, Mr. Xin He, Mr. Ormsub Soulisak, Mr. Mirza Golam Kibria, Mr. Pen Shun Lu*

Gathering: *In front of the Kyoto University Clock Tower Centennial Hall at 18:30 (after the campus tour)*
http://www.i.kyoto-u.ac.jp/en/introduction/access.html

Place: Detailed information to be distributed by Banquet Arrangement Chair: *Prof. Hidekazu Murata*

Important Notice: The banquet meal will be covered by the project budget but alcohol consumption will not be covered, according to the Japanese university rule. Please "go Dutch", when you order alcohol.

Transportation to the Venue:

The easiest access to the meeting venue is by taxi from "Imadegawa", K06 sub-way station of Karasuma-Line:

http://www.city.kyoto.lg.jp/kotsu/cmsfiles/contents/0000008/8995/metro_map20080116.gif

"Imadegawa" is on the way to Kyoto International Conference Center.

Those who participate in the friendly gathering taking place in the evening of March 25, let's decide how we meet then.

Those who come by yourself, please get off the sub-way at "Imadegawa", and show the printout of

http://www.kyoto-u.ac.jp/ja/access/campus/map6r_y.htm

to the taxi driver. Then, tell him that you are going to “Kyodai Nogakubu Mae” (in region C in the map). The meeting place is either in buildings 67 or 68.

Those who lost yourself or are in an emergency situation, please contact Prof. Tad Matsumoto at
+81-80-1158-9321 or +358-400-697-168

Key Person’s Hotel Information:

Prof. Markku Juntti: In an conference hotel of ICCASP 2012
Prof. Jan Sykora, and Prof. Trio Adiono: *Royal Park Hotel The Kyoto*
http://www.rph-the.co.jp/kyoto/
Prof. Alister Burr: Hotel Monterey Kyoto
http://www.hotelmonterey.co.jp/cgi-bin/portal/cms/hotelindex.cgi?hid=monkyo
Prof. Tad Matsumoto and Prof. Khoirul Anwar: *Petit Hotel Kyoto*
http://www.ph-kyoto.co.jp/

Abstracts of the Talks by the STC and Key Project Members

Prof. Alister Burr: "Cooperative Wireless Network Coding for Uplink Transmission on Hierarchical Wireless Networks"

The talk covers a very simple hierarchical wireless network in which two terminals transmit to a two relay base stations (RBS), which in turn communicate via wireless backhaul with a single hub base station. The objective of the proposed scheme is to allow the two RBSs to cooperate to serve both terminals without increasing the backhaul load compared to the non-cooperative case. This is implemented using adaptive wireless network coding, in which both RBSs employ wireless network coding using hierarchical decode and forward (HDF) with linear network coding maps adaptively chosen to optimise capacity

Prof. Jan Sykora: "DIWINE - Dense Cooperative Wireless Cloud Network"

DIWINE considers wireless communication in a dense relay/node scenario where WNC (Wireless Network Coding) messages are flooded via dense massively air-interacting nodes in the self-contained cloud while the PHY air-interface between the terminals and the cloud is simple and uniform. A complicated infrastructure cloud creates an equivalent air-interface to the terminal which is as simple as possible. Source and destination air-interfaces are completely blind to the cloud network-structure. The cloud can have its own intelligent content processing (mobile distributed computing). This concept creates energy-efficient, high throughput and low latency network communication performed directly at PHY level and capable of operating in complicated dense randomly-defined topologies.

Prof. Markku Juntti: "Radio Reseouce Management with Coordinated Multipoint Processing and Relaying"

This talk covers two most recent results of the research conducted by his group, published/to be published in:

J. Kaleva, A. Tölli & M. Juntti, "Coordinated downlink precoder design for regenerative multi-user relaying". Proceedings of IEEE International Conference on Communications (ICC 2012), Ottawa, Ontario, Canada, June 10–15, 2012,

P. Komulainen, A. Tölli & M. Juntti, "Decentralized beam coordination via sum rate maximization in TDD multi-cell MIMO systems". Proceedings IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC 2011), Toronto, Ontario, Canada, September 11–14, 2011

Prof. Trio Adiono: "Real-Time Low Power Wireless System Design and Implementation Methodology"

This topic presents the design methodology for designing real---time and low power wireless hardware system. The design is focused on Baseband Processor for Physical and MAC layer function. Current wireless system involves very complex operations, such as FFT/IFFT, Viterbi, Equalizer, Channel Coding, MIMO and Synchronizer. However, the operations have to be completed within a short time regarding to frame duration that can

reach 2.5 msec in the implementation. On the other hand, the power consumption and chip size also have to be very small. Therefore, optimization has to be done from early stage of system design, such as algorithm and architecture level, up to implementation level such as floor planning and placement and routing. Algorithm and architecture level plays a significant role in determining final system performance. Therefore, we must focus in both steps to achieve design specification. The proposed design methodology includes several steps in hardware design; functional model design, computation complexity reduction, bit precision modeling, architecture mapping, processing element exploitation and design implementation. Some architecture design method for performance improvement, such as parallel processing, pipelined, folding, unfolding are also used in this design approach. The real---time performance is measured in FPGA prototyping. Verification is done in RTL level, Radio Conformance Test and Field Test.

Prof. Hidekazu Murata and Mr. Mirza Golam Kibria: "Effect of Convolutional Code Choice on Turbo Equalization with Faster-than-Nyquist Signaling"

The goal is to explore and study the characteristics and performances of a turbo equalizer employing different choices of Convolutional Codes. Not all the choices of generator polynomial of same constraint length provide similar performance in terms of bit error rate and convergence over the turbo iterations. Faster-than-Nyquist signaling has been adopted in order to compensate the bandwidth expansion effect while still using binary modulation. The BCJR Algorithm, an optimal detection and decoding mechanism, is employed in Turbo Equalization. Important measures like bit error rate and convergence behavior have been used to evaluate the performance of the codes under different FTN ISI situations. The best codes for various constraint lengths are proposed.

Prof. Shinsuke Ibi: "Joint Channel-and-Network Coding Using EXIT Chart Aided Relay Activation"

The talk presents a relay activation scheme designed for joint channel-and-network (JCN) coded systems relying on an iterative decoding. A primary focus is on proposing criteria of the relay activation to find the best user combination for cooperative relaying, which exploits extrinsic information transfer (EXIT) chart analysis.

Prof. Motohiko Isaka: "Distributed coding for non-binary correlated sources"

(Kwansei Gakuin University)

We present coding schemes for distributed coding of correlated non-binary sources. Numerical results show that those approaches outperform the results in the literature.

Prof. Khoirul Anwar and Prof. Tad Matsumoto: "Iterative Spatial Demapping for Two Correlated Sources over Fading Multiple Access Channel"

This talk covers in frequency-flat quasi-static Rayleigh fading multiple access channel (MAC) the performances of Slepian-Wolf (SW)-based iterative spatial demapping (SWISM) for single antenna single carrier transmission with two correlated sources. Potential applications of the technique investigated in this talk are sensor and/or relay networks requiring high

throughput. The correlation between the sources is exploited in log-likelihood ratio (LLR) exchange via the vertical iteration (VI) loop between the two outer decoders. Computer simulations results confirm that the proposed SW-ISM structure achieves excellent performances over frequency-flat quasi-static Rayleigh fading MAC. Results of the SW and MAC rate regions analysis are also presented to evaluate the effectiveness of the technique.

Mr. Cheng Meng and Prof. Tad Matsumoto: "On the Duality of Source and Channel Correlation: Slepian-Wolf Relaying Viewpoint"

In this talk, we derive the theoretical outage probability of a transmission system in the presence of the source and channel correlations in block Rayleigh fading channels, based on the Slepian-Wolf theorem. Two transmitters and one common receiver are assumed, where the correlation knowledge between the two source information streams can be expressed as a bit-flipping model. Specifically, the information bits sent from the second transmitter are the randomly flipped version of the bits transmitted from the first transmitter, with a flipping probability p_e. The information bits at each transmitter are separately encoded and sent to a common decoder via the respective channels. In addition, we also assume the channels suffer from either independent or correlated Rayleigh fading. In block fading channels, the outage event happens when the instantaneous signal noise ratios (SNRs) of the two channels are lower than given threshold ratio. This paper shows that the outage probability of the system model described above can be expressed by double integrals of the admissible rate region according to the Slepian-Wolf theorem, with respect to the *joint* probability density function (*pdf*) of the instantaneous signal amplitudes (or equivalently the SNRs) of the channels. The theoretical outage performance shows that the 2nd diversity order can be achieved only when the two information streams are fully correlated, regardless of the channels being independent or not. On the contrary, the channel correlation makes opposite influence on the decay of the outage probability. However, if the two streams are not fully correlated, this influence gradually disappears as the average SNRs increases. In this sense, the source and channel correlation problems are dual with each other.