IEEE Information Theory Society Newsletter

Vol. 60, No. 3, September 2010 Editor: Tracey Ho ISSN 1045-2362

The principal annual awards of the Information Theory Society were announced at the 2010 ISIT, in Austin. The 2011 Shannon Award goes to Shlomo Shamai. The 2010 Wyner Award goes to Toby Berger. The winner of the 2010 IT Paper Award is the 2009 IT Transactions paper on Polar Codes by Erdal Arikan. The winner of the 2010 Joint IT/ComSoc Paper Award is the 2008 IT Transactions paper on coding for errors and erasures, by Ralf Koetter and Frank Kschischang. Five student authors of ISIT papers received the 2010 ISIT Student Paper Award: Yury Polyanskiy of Princeton, Jayadev Acharya of UCSD, Yashodhan Kanoria of Stanford, Arya Mazumdar of University of Maryland and Benjamin Kelly of Cornell. Finally, the 2010 Chapter of the Year Award was presented to the Russia Chapter.

The Claude E. Shannon Award, awarded for "consistent and profound contributions to the field of information theory," is the highest honor of the IT Society. Shlomo Shamai joined the Department of Electrical Engineering at Technion in 1986, where he is now the William Fondiller Professor of Telecommunications. He has co-authored over 170 journal papers. His research interests encompass a wide spectrum of topics in information theory and statistical communications. He is especially interested in theoretical limits in communication with practical constraints, multi-user information theory and spread spectrum systems, multiple-input-multiple-output communications systems, information theoretic models for wireless networks and systems, information theoretic aspects of magnetic recording, channel coding, combined modulation and coding, turbo codes and LDPC, in channel, source, and combined source-channel applications, iterative detection and decoding algorithms, coherent and noncoherent detection and information theoretic aspects of digital communication in optical channels. Dr. Shamai (Shitz) is an IEEE Fellow and a member of the Union Radio Scientifique Internationale (URSI). He is the recipient of the 1999 van der Pol Gold Medal of URSI, and a co-recipient of the 2000 IEEE Donald G. Fink Prize Paper Award, the 2003, and the 2004 Joint IT/COM Societies Paper Award, and the 2007 Information Theory Society Paper Award. He has served as Associate Editor for the Shannon Theory of the IEEE Transactions on Information Theory and served on the Board of Governors of the Information Theory Society. He will give the Shannon Lecture at the 2011 ISIT in Saint Petersburg, Russia.

The Aaron D. Wyner Distinguished Service Award recognizes an "individual who has shown outstanding leadership in, and provided longstanding exceptional service to, the information theory community." Toby Berger, Professor with the Department of Electrical and Computer Engineering University of Virginia, has served in every major role of the IT Society, including President (1979), Editor-in-Chief of the Transactions (1987–1989) and General Co-Chair of the 1977 ISIT in Ithaka, NY.

The Information Theory Society Paper Award is given annually to an outstanding publication in the fields of interest to the Society appearing anywhere during the preceding two calendar years. The winners of the 2010 award is *"Channel Polarization: A Method for Constructing Capacity-Achieving Codes for Symmetric Binary-Input Memoryless Channels"*, by E. Arikan, which appeared in the July 2009 IEEE Transactions on Information Theory. This paper introduces a new phenomenon termed *Channel Polarization* and introduces a particular recursive construction of codes, namely, Polar Codes, that exploits channel polarization through a successive

I have just returned from beautiful sunny Austin, Texas, where an enthusiastic team headed up by Benhaam Aazhang and Costas Georghiades organized a fantastic Symposium on Information Theory. As usual, the Symposium featured an outstanding technical program (organized by Michael Gastpar, Robert Heath, and Krishna Narayanan), with stimulating plenary talks from Michael Jordan, Abbas El Gamal, Tony Ephremides, and Ram Zamir. The highlight of the Symposium was the Shannon Lecture, entitled "Musing upon Information Theory," and delivered by Te Sun Han. The Symposium once

A

Suppose we have a circular table with n 1 1 equally spaced seats, and we have n 1 1 people, conveniently labeled 0, 1, 2, … , n, and suppose n $ 2.

In n consecutive rounds of seating, each of the people will have n neighbors on their right, and n neighbors on their left. We will call a seating arrangement "perfect" if it seats n + 1 people in n rounds in such a way that each person has every other person on their right exactly once, and on their left exactly once.

Here is an example of a *perfect* seating arrangement with 7 people in 6 rounds. Each row is a round, and is to be considered cyclically. For convenience, I have placed "person 0" at the left end of each row (so cyclically, also at the right end) and the other n people are permuted in a different way in each round.

0	1	2	3	4	5	6
0	2	4	1	6	3	5
0	3	1	5	2	6	4
0	4	6	2	5	1	3
0	5	3	6	1	4	2
0	6	5	4	3	2	1

Note that, ignoring the "all-zeroes" column at the left, what remains is a 6 3

1) Here is one uncountably infinite subfamily G of the family F of all infinite subsequences of the positive integers, such that for every pair of sequences S_1 and S_2 in G, the intersection $S_1 \cap S_2$ is finite.

For each real number $x \in [1/2, 1)$,

Each Distinguished Lecturer will serve for two years, so that in steady state there will always be 10 lecturers.

Chapters desiring to invite a Distinguished Lecturer must submit a proposal indicating the benefit to the chapter. The proposals will be evaluated by the MCC, and if approved will be forwarded to the Distinguished Lecturer. The value of the program will be assessed via feedback from both the chapters and the Distinguished Lecturer. The chapters will be asked to post the slides on the Society web site, and if possible, the video of the lecture as well.

April 15, registrations June 1. The Summer School will have a new format, with six two-hour lectures during the first three days. The school Has been registered with IEEE as a conference, with ITSoc as the sponsor. Already $10K has been approved from the Society to be provided to the Summer School in 2010. The dorm contract has been submitted to the IEEE for review. Five potential instructors have been contacted. Jack Wolf will be the Padovani Lecturer. There will be efforts to encourage participation from local residents and from Mexico. With regard to fundraising: $58K was raised last year, including $10K from ITSoc, $10K from NSF, and the remaining from other sources. The committee requests that the society provide an additional $10K this year to reach the same level as last year ($20K). This request was approved by the BoG unanimously.

10) The Publications Committee report was represented by Frank Kschischang for the Editor-in-Chief, Ezio Biglieri. There was no report. A motion was made to appoint James Massey to replace John Anderson as the Book Review Editor.

There was a report by Alex Grant on migration to ScholarOne. The ScholarOne web site has gone active and is being tested by Alex Grant, Adriaan van Wijngaarden, Ezio Biglieri and Helmut Bölcskei. Helmut Bölcskei is the designate for the next Editor-in-Chief, to be formally approved at the BoG Annual Meeting. It is expected that ScholarOne will streamline the work of the Associate Editors. In the officers meeting, held a day earlier, the possibility of hiring a staff person was raised, but this will be up to the incoming Editor-in-Chief. Helmut Bölcskei is in the process of putting together a manifesto with regard to the outstanding issues that need to be addressed with our Transactions.

-rTj -cTj -f t

11) The Conference Committee report was presented by the chair, Bruce Hajek. For ISIT Seoul, a surplus of about $64K is expected. For ISIT 2010 (Austin) everything seems to be on track. For ISIT 2011 (St Petersburg), the date will be the first week of August 2011. The web site is up, and the final budget is in preparation. It was mentioned that at the same time as ISIT 2010, the SIAM discrete math biannual meeting will be taking place in Austin, and it was suggested to explore an agreement with SIAM for mutual admission of the attendees of the two conferences.

ISIT 2012 Cambridge/MIT is on track. An update will be given at the next BoG meeting.

ISIT 2013, to be held in Turkey, has been preliminarily approved. The loan requested by ISIT 2013 is 125,000 euros. Questions were asked about the schedule of the loan. A motion for the location of ISIT 2013 (Turkey) and for granting the loan for ISIT 2013 were approved by the BoG.

Interest has been expressed for ISIT 2014 in the San Francisco Bay area and Hawaii. For 2015, interest has been expressed for China or Hong Kong by Raymond Yeung and Pingzhi Fan.

ITW Volos 2009 anticipates a $2.5K surplus. The Conference Committee is awaiting the final report from the Taormina and Cairo ITWs. In Cairo there were 207 participants. ITW Cairo had approximately $10K surplus, and Hesham El Gamal has suggested to use it for a winter school of information theory in Cairo. However, the BoG encouraged ITW Cairo to close the books and do the winter school proposal separately.

For ITW 2010 Dublin, the hotel contract has been finalized. A motion was made to approve the budget for ITW Dublin, and the motion was carried unanimously.

Max Costa made a presentation for the proposed ITW at Paraty, Brazil. The topics include coding, cryptography, compressed sensing, and related areas. The local attractions as well as the budget were presented. A BoG member made a comparison with the ITW 2006 in Punta del Este, which was also remote and very successful, but in contrast it was much cheaper. It was mentioned that Punta del Este is much more accessible than Paraty, and there was concern about the accessibility of the location. After extensive discussions, a motion for the workshop and its budget were approved by majority vote of BoG.

A proposal was made for technical co-sponsorship of Allerton 2010 (jointly with the IEEE Control Society). This proposal was approved by the BoG. A proposal was made for technical co-sponsorship of SIBIRCON 2010. A discussion ensued about the quality of the conference, its acceptance rates, and the relationship of the conference to the core area of ITSoc. The motion for tmote and very 4(e)-9((S)-14(o)-1

:

, 7 14

Recently there has been a spurt of activity on the discrete memoryless broadcast channel problem, notable successes being strictly better outer bounds; a new cardinality bounding technique that makes the evaluation of Marton's inner bound feasible; the demonstration of a gap between the best known inner and outer bounds for the binary skew-symmetric broadcast channel; use of indirect decoding to strictly improve achievable regions for three or more receivers; and the determination of the capacity region for certain classes of BISO channels. A small workshop, with generous support from the Institute of Network Coding (http://www.inc.cuhk.edu.hk) and the Institute of Theoretical Computer Science and Communication (http://www.itcsc.cuhk.edu.hk) was arranged to bring together some researchers who have been very active in this area recently. Prof. Venkat Anantharam (UC Berkeley), Amin Aminzadeh Gohari (UC Berkeley), Prof. Abbas El Gamal (Stanford), and Prof. Young-Han Kim (UCSD) joined locals Prof. Chandra Nair, Vincent Wang, and Yanlin Geng for this week-long workshop at The Chinese University of Hong Kong.

A. , . A , . , A. , .

- . ,

The idea was to make sense of these recent developments in the discrete memoryless broadcast channel problem and to share insights and intuition. The air was full of suspense: can one improve on Marton's inner bound or is this the true capacity region?; can one establish optimality of the current outer bound or can we strictly improve it? None of these fun questions was resolved during the workshop, thus not depriving others of this wonderful 'pursuit of happyness', but the participants went away better equipped in their attempts to reach the summit. The technical discussions centered around the key developments that have taken place in the preceding three years. (For those interested, a monograph on these developments is under preparation and may be forthcoming in the coming months.) For the larger audience in the universities in Hong Kong, lectures provided by the participants in the first two days outlined most of the classical and recent results. (The videos and slides of the lectures can be downloaded at http://www.inc.cuhk.edu.hk/event.html)

A hike along Dragon's Back trail that offered glorious views of the eastern coastline of Hong Kong Island, trips to Victoria Peak and Stanley Market, and savoring some of the local culinary delights provided welcome respite during the week-long event.

Since 2005, NetCod has been a very successful series of workshops providing an International forum for the presentation and discussion of new research and ideas on network coding, ranging from theoretical results to practical applications. Network coding research has expanded its scope, and continues to be an active research field in the information theory and networking communities. It has been the tradition of past NetCod workshops to represent inter-disciplinary and focused research, with an emphasis on innovation.

The Technical Program of NetCod 2010 includes 21 technical papers in its Proceedings, which have been selected by an expert Technical Program Committee from a total of 38 paper submissions. It spans eight technical sessions from June 9 to June 11, and covers a wide range of research topics. In addition to more traditional network coding topics such as network code construction, the scope of NetCod 2010 has included high-quality work in some recently active research directions, including security issues involving network coding, as well as the application of network coding in wireless networks, peer-to-peer networks, and distributed storage systems. As a result, some of the technical sessions reflect these research directions, such as “Security with Network Coding,” “Network Coding in Practical Networks,” and “Applications of Network Coding.” NetCod 2010 sessions have covered the complete spectrum of network coding research, from theory to practice.

Much effort by the Technical Program Committee has gone into putting together the high-quality technical program that we included in NetCod 2010. The quality and quantity of submissions were both strong. The program committee has had a difficult task to select the papers among many high-quality deserving paper submissions. Similar to NetCod workshops in previous years, the reviewing process has been completed within a very short period of time, in order to include the latest results in the area of network coding research.

NetCod 2010 has invited three plenary keynote speakers, Professor Babak Hassibi from California Institute of Technology, Professor Christina Fragouli from EPFL, and Professor Alex Dimakis from University of Southern California, to offer three plenary talks, one in each day of the conference. The topics of their talks were as follows:

During these plenary talks, the keynote speakers have enlighten the audience with their own perspectives on the future of network coding research.

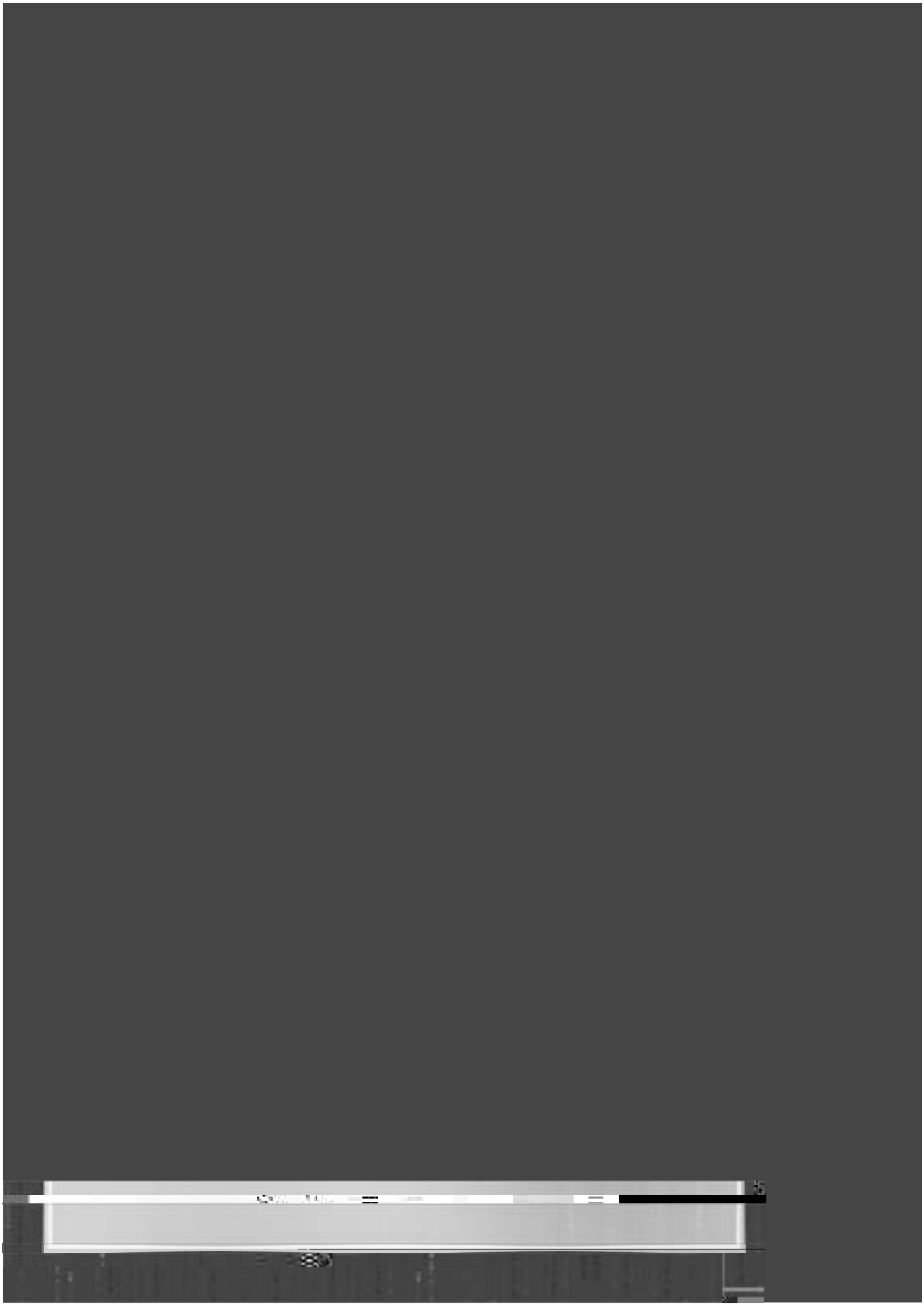
48 researchers from both academia and industry have attended for the event, including the chairs and keynote speakers.

The ch.

every day. All the attendees have enjoyed the quality of the keynote talks and technical sessions, as well as the live discussions in the conference.

In summary, building on the successes of previous NetCod workshops, NetCod 2010, technically sponsored by the IEEE Information Theory Society, and financially sponsored by MITACS Inc., has successfully continued its tradition to bring together researchers and practitioners working in this area to discuss recent and innovative results, and to identify future directions and challenges in developing breakthrough theoretical results and real-world practical applications with network coding.

Baochun Li and Frank Kschischang,
NetCod 2010 Co-chairs
Department of Electrical and Computer Engineering
University of Toronto



DA E C FE E CE L CA I EB AGE