



THE CHINESE UNIVERSITY OF HONG KONG
 Institute of Network Coding
 and
 Department of Information Engineering
Seminar



Joint Channel/Network Coding for Star Networks

by

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University of Notre Dame

Date : 7 October 2013 (Monday)
Time : 10:30 - 11:00 am
Venue : Room 833, Ho Sin Hang Engineering Building
The Chinese University of Hong Kong

Abstract

Channel coding alone is not sufficient to reliably transmit a message of finite length from a source to one or more destinations as in, e.g., file transfer. To ensure that no data is lost, it must be combined with rateless erasure correcting schemes on a higher layer, such as a time-division multiple access (TDMA) system paired with automatic repeat request (ARQ) or random linear network coding (RLNC). We consider binary channel coding on a binary symmetric channel (BSC) and qary RLNC for erasure correction in a star network, where Y sources send messages to each other with the help of a central relay. We focus on finite block lengths and compare the expected throughputs of RLNC and TDMA. For a total message length of K bits, which can be subdivided into blocks of smaller size prior to channel coding, we obtain the channel coding rate and the number of blocks that maximize the expected throughput of both RLNC and TDMA, and we find that TDMA is more throughput-efficient for small K and small q .

Biography

Daniel J. Costello, Jr. was born in Seattle, WA, on August 9, 1942. He received the B.S.E.E. degree from Seattle University, Seattle, WA, in 1964, and the M.S. and Ph.D. degrees in electrical engineering from the University of Notre Dame, Notre Dame, in 1966 and 1969, respectively.

In 1969 Dr. Costello joined the faculty of the Illinois Institute of Technology, Chicago, IL, as an Assistant Professor of Electrical Engineering. He was promoted to Associate Professor in 1973, and to Full Professor in 1980. In 1985 he became Professor of Electrical Engineering at the University of Notre Dame, Notre Dame, IN, and from 1989 to 1998 served as Chair of the Department of Electrical Engineering. He also was a Research Associate at Cornell University (Summer 1971) and a Visiting Professor at Notre Dame (1983-84), the Swiss Federal Institute of Technology (Spring 1995), the University of Hawaii (Fall 1998), and the Technical University of Munich (Summer/Fall 2001, Summer 2003, Summer 2005). He has served as a professional consultant for Western Electric, Illinois Institute of Technology Research Institute, Motorola Communications, Digital Transmission Systems, Tomorrow, Inc., and he has provided expert witness testimony in several patent infringement lawsuits.

In 1991, Dr. Costello was selected as one of 100 Seattle University graduates to receive the Centennial Alumni Award in recognition of those who had displayed outstanding service to others, exceptional leadership, or uncommon achievement. In 1999, he received a Humboldt Research Prize from the Alexander von Humboldt Foundation in Germany. In 2000, he was named the Leonard Bettex Professor of Electrical Engineering at Notre Dame, and in 2009 he became Bettex Professor Emeritus.

Dr. Costello has been a member of IEEE since 1969 and was elected Fellow in 1985. Since 1983, he has been a member of the Information Theory Society Board of Governors on three separate occasions, and in 1986 he served as President of the BOG. From 1992-1995 he was Chair of the Conferences and Workshops Committee and from 2001-2002 and from 2007-2009 Chair of the Fellows Committee of the BOG. In 2012, he was named Chair of the IEEE Hamming Medal Committee. He has also served as Associate Editor for Communication Theory for the IEEE Transactions on Communications, as Associate Editor for Coding Techniques for the IEEE Transactions on Information Theory, as Co-Chair of the IEEE International Symposia on Information Theory in 1988 in Kobe, Japan, in 1997 in Ulm, Germany, and in 2004 in Chicago, IL, and as co-TPC Chair of the IEEE Information Theory Workshop in 2009 in Taormina, Sicily.

In 2000, Dr. Costello was selected as a recipient of an IEEE Third Millennium Medal. In 2009, he was co-recipient of the IEEE Donald G. Fink Prize Paper Award, which recognizes an outstanding survey, review, or tutorial paper in any IEEE publication issued during the previous calendar year. In 2012, he was a co-recipient of the joint IEEE Information Theory Society/Communications Society Prize Paper Award, which recognizes an outstanding research paper in the IT or COM Transactions during the previous two calendar years. In 2013, he received the Aaron D. Wyner Distinguished Service Award from the IEEE Information Theory Society, which recognizes outstanding leadership in and long standing exceptional service to the Information Theory community.

Dr. Costello's research interests are in the area of digital communications, wireless communications, and networking, with special emphasis on error control coding, iterative information processing, and coded modulation. He has more than 400 technical publications in his field, and in 1983 he co-authored a textbook entitled "Error Control Coding: Fundamentals and Applications", the 2nd edition of which was published in 2004.

**** ALL ARE WELCOME****

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