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IEEE Transactions on Information Theory - Decision on Manuscript ID IT-11-0010

weiyu@comm.utoronto.ca <weiyu@comm.utoronto.ca> Sun, Aug 12, 2012 at 12:42 PM
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12-Aug-2012

Dear Prof. Nair:

First please let me apologize again for the inordinate review time for your manuscript: ID IT-11-0010, titled: "An information inequality and evaluation of Marton's inner bound for binary input broadcast channels". I have now received three reviews, and am happy that all three reviewers have recommended acceptance of your paper subject to minor revisions. I have also read the paper myself and believe the main result of paper to be significant and is a good fit to the IEEE Transactions on Information.

Therefore, I would like to accept your paper ID IT-11-0010 for publication in the IEEE Transactions on Information Theory. I believe that the minor revisions that the reviewers asked for (which I refrain from repeating here) concern mainly with the style of the presentation, which can be easily taken care of by the authors, and will not require a further round of review.

Please see the reviewers' comments at the end of this email and as attached in the enclosed PDF file. The PDF file is also available through your Author Center on the ScholarOne Manuscripts web site. Please check there also to make sure you have received all reviewer comments.

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Thank you very much for your contribution. Congratulations!

Sincerely,

Dr. Wei Yu
Associate Editor, IEEE Transactions on Information Theory
weiyu@comm.utoronto.ca

Reviewer(s)' Comments to Author:

Reviewer: 1
Comments to the Author

The authors derive an information theory inequality involving 5 random variables. This inequality is then used in evaluate the sum rate of Marton's inner bound and outer bound on a special type of two receiver broadcast channel with binary input, the BSSC channel. The result shows a case in which inner bound and outer bound do not match in sum rate. This paper also corrects a result reported earlier. The technique and results in this paper shed new lights on understanding Marton's inner bound and outer bound on broadcast channel. It also demonstrates an example in using perturbation method. Hence I suggest to accepting this paper. Detailed comments are in the following.

1. There are 3 bounds (Marton's inner bound, UV outer bound and Korner-Marton outer bound). In section 1.1, only bound 1 and bound 2 are presented. Bound 3 appears very late in the paper. However, the reference to bound 3 appeared much earlier (in section 1.1, 1.2, ...). It would be clearer if the authors present bound 3 also in section 1.1. It is also easier to compare the form of bound 2 and 3 when put them next to each other.

2. I think section 4.2.1 should be evaluating bound 2. However, the title and some text in that section refers to bound 3.

3. The notation for BSSC is not consistent. In section 1,2,3 the two outputs are labeled X and Y, yet in section 4 they are labeled Y_1 and Y_2. It would be nice to stick to one notation.

4. Figure 4 is the same as Figure 1 and can be removed.

Reviewer: 2
Comments to the Author
Review: An Information Inequality and Evaluation of Marton's Inner Bound for Binary Input Broadcast

Channel

By Greng, Jorg, Nair, Wang

This paper does a remarkable job in illustrating the fine structure of the Marton's inner bound for the discrete-memoryless broadcast channel for the special case of input alphabet being restricted to cardinality of 2.

The main result is Corollary 1, which states that the Marton's inner bound reduces to a time-sharing strategy for |X|=2. This is a nontrivial result, obtained with fairly sophisticated arguments based mostly on a perturbation method on the probability distributions. Although I have not checked all the mathematics, I am quite impressed that the authors are able to derive such an argument. I believe that the paper should be accepted.

The fact that Marton's inner bound and the best outer bound do not agree is also quite worthy of being documented in the IT Transactions.

I have only some minor comments:

1. Can the authors make a short comment on whether the 5-tuple inequality is a Shannon-type inequality or not?

2. p.2: After Bound 2, the papers talks about Bounds 1 and 3 agree. It is either a typo or a reference to the not-yet-identified Korner-Marton bound. In any case, it is probably better to number inner and outer bounds differently.

2. p.3: I would call "Corollary 1" a theorem, as this is the main result of the paper.

3. The paper is sloppy in notation or writing at places, e.g. (i) "SR" is used to denote sum-rate without being defined. (ii) If you write "Proof" at the bottom of p.4, then the statement should be clearly stated, as a Lemma, for example. (iii) Before (3), it is unusual to start a sentence with capitalized abbreviation "W.l.o.g.".

4. I am not sure how the numerical evaluat of Marton's inner bound on p.12 is obtained, especially P(X=0)=0.5-sqrt(105)/30 needs some explanation.

Reviewer: 3
Comments to the Author
(Comments are included as a file attachment with this e-mail or as an attachment in your Author Center.)

- First.pdf
94K

First, this reviewer would like to apologize for the delay in getting this review back. I finally got the opportunity to read the paper, and I should say that I am quite happy with the results obtained.

In this paper, the authors aim is to evaluate the sum rate corresponding to Marton's inner bound for a two receiver broadcast channel with binary inputs, and to show that a (randomized) time division achieves this inner bound. To do this, a stepping stone is a new cardinality bound for evaluation the inner bound (which I think is one of the main elegant features of this paper).

Subsequently, the inner and outer bounds for the binary skew symmetric BC case are computed to show a gap between them. The paper is novel and very interesting. This reviewer has only a few minor comments:

1. The BSSC as introduced in Figure 1 is too specific (for example, I would feel that similar insights should hold for a more general transition probability p). In the same vein, Theorem 3 does not feel like a theorem, more like an illustration or a remark as it is a very specific computation rather than a general sum-rate expression. I would recommend downgrading Theorem 3, and to focus on the mutual-information based expressions instead.
2. I would restructure the paper: I would recommend placing the proofs after the sum rate evaluations. As it stands, I find that the reader can get caught in the proofs and lose track of the big picture. The main results and evaluations present the entire story, after which the proofs can come in.

Overall, I find this to be a valuable contribution and recommend it be accepted.