#1569420257: *Degrees of Freedom of the Interference Channel: a General Formula*

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Presenter		presenter not specified
Registration		
Category		Eligible for ISIT Student Paper Award
Title		*Degrees of Freedom of the Interference Channel: a General Formula*
Abstract		We give a general formula for the degrees of freedom of the K-user real additive-noise interference channel involving maximization of information dimension. Previous results are recovered and improved with simplified proofs. Connections to fractal geometry are drawn.
Keywords		interference channel, degrees of freedom, information dimension
Topics		Multiple terminal information theory; Network communication theory
Session		The program is not yet visible (tpc)
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Review manuscript	Document (show)	Pages	File size	Changed	MD5	Similarity score
	PDF	5	186,308	February 15, 2011 21:53:22 EST	663530ef5dc35f5aee472244dd3f6d47	14

Final manuscript		Can upload 5 pages until May 31, 2011 00:00:00 EDT.

Personal notes

Reviews

You are a TPC member for this conference.

1 Review

Review 1 (Reviewer B)

Importance	Technical Level	Novelty	Presentation	Recommendation
Extremely Important (5)	Extremely high technical level (5)	Very Novel (4)	Excellent (5)	Strongly Recommend (5)

Strengths (What are the key strengths of this paper?)

The paper connects the DoF of the channels to a Renyi's information dimension. The core result of the paper is Theorem 1, which shows that DoF of the channels can be reformulated by Renyi's information dimension. Therefore, to characterize the DoF of the channels, we should find input distribution which maximize (26).

This paper gives us a deeper understanding about the results of [1][3][5]. It also allows us to reproduce or confirm [1][3][5] in a simpler and unified way. It may also help us to derived the DoF of some channels, specially channels integer channel gains in a systematic approach.

Weaknesses (What are the major weaknesses of this paper?)

1- For Theorem 4, is it based on the input distribution proposed by [3] or it follows from another input distribution? Anyhow this theorem should refer to [3].

2- Initially in the following paper, deterministic model has been used to show that structured (lattice) codes are helpful, and somehow needed, to align interference in signal layers, specially for time--invariant channels. It should be added to the reference list:

The Approximate Capacity of the Many-to-One and One-to-Many Gaussian Interference Channels
Bresler, G.; Parekh, A.; Tse, D.N.C.;

3- At this point, the paper provides us a deeper understanding more about the known results. The power of this tool should be examined by characterizing the DoF of the new channels, like channels with integer channel gains.

For TPC eyes only (Write here if you have comments you don't wish the author to see.)

The paper introduces a new tool to the field to characterize the DoF of the time-invariant channels. However, it fails to derive new results using this tool.

1 Summary review by TPC member

Review 1 (Reviewer A)

TPC recommendation

Strong accept (5)

TPC Recommendation Justification (Please give a justification for your recommendation, especially if the review scores vary widely or your recommendation differs significantly from those of the reviewers.)

That Renyi dimension should play a crucial role in almost noiseless settings is perhaps not a huge surprise. However, that it leads to such clean formulations is (at least to me). The connection to Renyi dimension explains to a large extent why DoF is so sensitive to underlying assumptions and casts further doubt of its engineering significance.

Student Paper Award (This paper is eligible for the student paper award. The TPC needs to identify 10-15 semifinalists for the award from among the 500 submitted eligible papers. Later the IT Society Awards committee will select up to three winners. If you think this paper is worthy of the award, please send a one page nomination to the TPC cochairs at isit2011@eng.tau.ac.il with "STUDENT AWARD NOMINATION" in the subject header. The TPC co-chairs and IT Society Awards committee will have access to the papers, reviews (including your TPC summary review) and the nominations of the finalists. (You need not write anything in the box here.))

Possible.

Discussion

Not a reviewer.
Apr 16, 2011 04:21

A TPC MEMBER SUBMITTED THE FOLLOWING NOMINATION OF THIS PAPER FOR THE STUDENT PAPER AWARD:
The paper shows a connection between Renyi's information dimension (the limit of H(floor(n X)) / log n) and the degrees of freedom in interference channels. In particular, the paper gives a single letter expression for the DoF in terms of this information dimension (hidden here is of course the fact that the Renyi dimension is not easy to compute). Nevertheless the connection is valuable: e.g., Renyi's information dimension is a very "unstable" quantity, "small changes" in the distribution of X can lead to large changes in the Renyi dimension. In this way it helps one understand the a priori strange results such as the DoF changing radically depending on the cross-gain being rational/irrational.

My rationale for the nomination more lies in the papers introduction of a hitherto less well known quantity to mainstream problems; it clearly is not a "follow the crowd" paper.