

Improving Achievable Rate for the Two-User SISO Interference Channel with Improper Gaussian Signaling

Yong Zeng, Cenk M. Yetis, Erry Gunawan, Yong Liang Guan, Rui Zhang

(Submitted on 1 May 2012 (v1), last revised 9 May 2012 (this version, v2))

This paper studies the achievable rate region of the two-user single-input-single-output (SISO) Gaussian interference channel, when the improper Gaussian signaling is applied. Under the assumption that the interference is treated as additive Gaussian noise, we show that the user's achievable rate can be expressed as a summation of the rate achievable by the conventional proper Gaussian signaling, which depends on the users' input covariances only, and an additional term, which is a function of both the users' covariances and pseudo-covariances. The additional degree of freedom given by the pseudo-covariance, which is conventionally set to be zero for the case of proper Gaussian signaling, provides an opportunity to improve the achievable rate by employing the improper Gaussian signaling. Since finding the optimal solution for the joint covariance and pseudo-covariance optimization is difficult, we propose a sub-optimal but efficient algorithm by separately optimizing these two sets of parameters. Numerical results show that the proposed algorithm provides a close-to-optimal performance as compared to the exhaustive search method, and significantly outperforms the optimal proper Gaussian signaling and other existing improper Gaussian signaling schemes.

Comments: Version 2, Invited paper, submitted to Asilomar 2012

Subjects: **Information Theory (cs.IT)**

Cite as: [arXiv:1205.0281](https://arxiv.org/abs/1205.0281) [cs.IT]

(or [arXiv:1205.0281v2](https://arxiv.org/abs/1205.0281v2) [cs.IT] for this version)

Submission history

From: Yong Zeng [[view email](#)]

[v1] Tue, 1 May 2012 23:16:01 GMT (462kb,D)

[v2] Wed, 9 May 2012 06:09:59 GMT (477kb,D)

[Which authors of this paper are endorsers?](#)

Download:

- [PDF](#)
- [Other formats](#)

Current browse context:

cs.IT

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1205](#)

Change to browse by:

[cs](#)

[math](#)

References & Citations

- [NASA ADS](#)

DBLP - CS Bibliography

[listing](#) | [bibtex](#)

[Yong Zeng](#)

[Cenk M. Yetis](#)

[Erry Gunawan](#)

[Yong Liang Guan](#)

[Rui Zhang](#)

Bookmark (what is this?)

