On an Agent-aided Noisy Feedback Scheme

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Abstract

In this brief note, the authors propose a parallel layer next to an asymptoting two-phase noisy feedback scheme, say, of Sahai-Simcek (2004) for the DMC or Chawla (2006) for the AWGNC. This layer is a non-streaming layer, used as a 'scratch-pad' to improve the streaming quality of the main layer.

In [1, 2], the authors discuss two phase schemes for the achievability part of the AWGNC and DMC noisy feedback reliability function, respectively. In the present note, we propose that in parallel to the anytime-corrected [3] streaming data, we have a side channel which is governed by an AI or other intelligent agent that performs retrospective backtracking (RB) and correction of the data gathered from the main channel. Specifically, this side channel agent requests, at any given time, the transmitter to re-provide a certain transmission in case of uncorrectable error, continuing to make such requests until a correct transmission is received.

Thus, this side channel will have a geometric random variable governing the expected number of cycles before the first success (correct transmission). Call this expected value β. If β is significantly less than d, the anytime delay of the main channel, then the agent can probabilistic-ally inject its packets into the main stream (with replacement of the corresponding main stream packets) and potentially generate a better streaming performance overall.

In future work we hope to characterize the performance of this aided-AWGNC with noisy feedback. The overall aim will be to understand and harness noisy feedback in communication systems.

References

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[2] Anant Sahai and Tunç Şimşek. On the variable-delay reliability function of discrete memoryless channels with access to noisy feedback. In *Information Theory Workshop, 2004. IEEE*, pages 336–341. IEEE, 2004.

[3] Anant Sahai and Sanjoy Mitter. The necessity and sufficiency of anytime capacity for stabilization of a linear system over a noisy communication link - Part I: Scalar systems. *IEEE Transactions on Information Theory*, 52(8):3369–3395, 2006.