A Lower bound for Cooperative Broadcast in the presence of noise

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Abstract

In a noisy broadcast channel, processors communicate as follows: in each time step, one processor broadcasts a bit. Each of the other processors receives a bit, but the received bit is incorrect with some known probability p. Reception errors are assumed to be independent.

In such an environment, a group of n broadcasters, each possessing a bit, wish to transmit all n bits to a receiver so that, with probability close to 1, the receiver learns all of the bits correctly. This can be done easily with $O(n \log n)$ broadcasts, by having each processor broadcast its input bit $C \log n$ times (for some sufficiently large constant C) and having the receiver decode each bit by majority vote. This naive algorithm was improved by Gallager who, in 1988, gave an algorithm that uses only $O(n \log \log n)$ broadcasts.

I'll describe a recent result, obtained with Navin Goyal and Guy Kindler, showing that Gallager's algorithm is optimal up to a constant factor.

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