On the Corner Points of the Capacity Region of a Two-User Gaussian Interference Channel

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ABSTRACT

This talk considers the corner points of the capacity region of a two-user Gaussian interference channel (GIC). In a two-user GIC, the rate pairs where one user transmits its data at the single-user capacity (without interference), and the other at the largest possible rate (for reliable communication) are called corner points. This paper relies on existing outer bounds on the capacity region of a two-user GIC to derive informative bounds on the corner points of the capacity region. The new bounds refer to a weak GIC (i.e., both cross-link gains in standard form are positive and below 1), and a refinement of these bounds is obtained when one user operates at rate that is smaller by ε from the single-user capacity. Upper and lower bounds on the gap (denoted by Δ) between the sum-rate and the maximal achievable total rate at the two corner points are derived. This is followed by an asymptotic analysis analogous to the study of the generalized degrees of freedom (where the SNR and INR scalings are coupled such that $\frac{\log(\text{INR})}{\log(\text{SNR})} = \alpha \geq 0$), leading to an asymptotic characterization of this gap which is exact for the whole range of α. The upper and lower bounds on Δ are asymptotically tight in the sense that they achieve the exact asymptotic characterization. Improvements of the bounds on Δ are derived for finite SNR and INR, and these improved bounds are exemplified numerically. This talk is based on a journal paper that has been recently submitted to the *IEEE Transactions on Information Theory*.