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Interference Alignment for Wired Networks with General Message Demands

The concept of interference alignment was originally proposed for wireless interference channels. The basic idea of interference alignment is to choose the precoding matrices at the transmitters such that the interference at the receivers are aligned so that the interference dimension is reduced. Recently, interference alignment was proposed to be used also in the wired networks. In a three source three destination node setup, it was shown that each user can achieve a rate of one half when the min-cut is one and the network transfer functions satisfy certain conditions. In this paper, we extend the idea of using interference alignment in wired networks to more general networks. We consider networks with K source nodes and J destination nodes with arbitrary message demands. The result for the general case states that a sum rate of all the demanded source messages plus the biggest interferer's rate has to be smaller than the min-cut between the source nodes whose messages are demanded and the destination node.