Communication with Unreliable Entanglement Assistance

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Entanglement assistance can increase communication rates [1, 2]. However, shared entanglement is a highly fragile resource [3]. Therefore, the potential absence of entanglement assistance must be considered in the analysis of realistic channel models. To address this, Pereg et al. [4] introduced the concept of unreliable entanglement assistance.

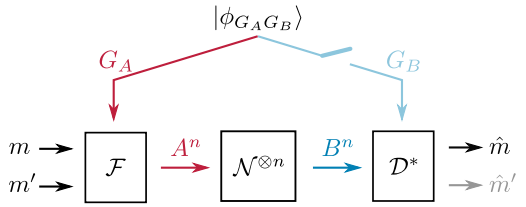

Figure 1: Model of unreliable entanglement assistance

This concept involves splitting communication into an unassisted and an entanglement-assisted message (cf. Figure 1), with the decoding operation depending on the availability of entanglement assistance. This talk will delve into this concept in detail. We will consider the classical capacity theorem and examine different coding strategies. These strategies will be applied to different channel models to compare their performance, demonstrating their optimality in specific scenarios, such as entanglement-breaking depolarizing channels, as shown in [5].

Furthermore, the talk will propose a stochastic model for the availability of entanglement assistance, building upon the previous model. In addition to considering worst-case and best-case communication rates, this model allows for analyzing average communication rates. We will first differentiate this model from existing similar ones [6, 7]. Then, we will optimize coding strategies using numerical calculations for selected channel models to maximize the resulting communication rates.

Finally, we will briefly address secure communication over such channels [8].

References

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