
GUS GUTOSKI, University of Waterloo

Properties of Local Quantum Operations with Shared Entanglement

Multi-party local quantum operations with shared quantum entanglement or shared classical randomness are studied. The following facts are established:

- There is a ball of local operations with shared randomness lying within the space spanned by the no-signalling operations and centred at the completely noisy channel.
- The existence of the ball of local operations with shared randomness is employed to prove that the weak membership problem for local operations with shared entanglement is NP-hard.
- Local operations with shared entanglement are characterized in terms of linear functionals that are “completely” positive on a certain cone K of separable Hermitian operators, under a natural notion of complete positivity appropriate to that cone. Local operations with shared randomness (but not entanglement) are also characterized in terms of linear functionals that are merely positive on that same cone K .
- Existing characterizations of no-signalling operations are generalized to the multi-party setting and recast in terms of the Choi–Jamiołkowski representation for quantum super-operators. The relationship between no-signalling operations, local operations with shared entanglement, and so-called “separable” quantum operations is briefly discussed.

<http://arxiv.org/abs/0805.2209>