Braid Information Theory

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Abstract

In this note, the authors suggest a novel approach to information theory using braids from knot theory. The approach is aptly called B.I.T., or Braid Information Theory.

There is a braids representation of quantum states [1]. We ask the question if it can be extended to mixed quantum states [2]. One could use such an extension, along with the correspondence between quantum channels and density operators, called the Choi-Jamiolkowski isomorphism [3], in order to create braid representation for quantum channels.

Classical channels are special cases of quantum channels and therefore one can propose a braid representation for classical channels. Given that a classical communication network of several nodes is nothing but a braid of braids, we can also propose a braid representation of a network of channels.

Furthermore, there is a braid representation for quantum gates [4]. Thus braids unify all of quantum computation and quantum information theory (at least finite dimensional theory), from states, to gates, to channels. Additionally, they provide a new approach to classical information theory. Finally, we can also consider what happens when one or two strings in a braid are damaged/disabled - the consequences for the corresponding channel [5].

References

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