Erratum: Geometry of discrete quantum computing

Andrew J. Hanson

School of Informatics and Computing, Indiana University, Bloomington, IN 47405, U.S.A

Gerardo Ortiz

Department of Physics, Indiana University, Bloomington, IN 47405, U.S.A

Amr Sabry

School of Informatics and Computing, Indiana University, Bloomington, IN 47405, U.S.A

Yu-Tsung Tai

Department of Mathematics, Indiana University, Bloomington, IN 47405, U.S.A
School of Informatics and Computing, Indiana University, Bloomington, IN 47405, U.S.A

Keywords: 20 October 2015

Sec. 5.4 of our paper [1] requires a clarification and a correction.

Clarification: Unentangled vs. product states. In conventional quantum mechanics, using the real and complex numbers, a state is unentangled when it can be expressed as a product state or when equation (27) reports its purity to be 1. When using finite fields, it is possible for equation (27) to produce a purity of 1 for some entangled states. For example, consider the 3-qubit state ...

Thus, in finite fields, the simplest way to calculate the number of unentangled states is to ignore equation (27) and to count the number of product states. This is exactly how the counting in Sec. 5.4 was produced but the paper did not clarify that counting using equation (27) would be incorrect.

Correction: Maximally entangled states. In conventional quantum mechanics, a state is maximally entangled when equation (27) reports its purity to be 0. In the discrete case, states whose purity is a multiple of the field characteristic are incorrectly labeled as maximally entangled. For example, ...

To correctly account for maximally entangled states, we modify equation (27) as follows:

...

Acknowledgments

We would like to thank John Gardiner for pointing out the need for this correction.

References

[1] Andrew J Hanson, Gerardo Ortiz, Amr Sabry, and Yu-Tsung Tai. Geometry of discrete quantum computing. *Journal of Physics A: Mathematical and Theoretical*, 46(18):185301, 2013.