



[conjecture]

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Entanglement of Superposition and Superposition of Entanglement

Open Mathematics Collaboration^{*†}

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Abstract

We consider that the superposition of space is given by the Bell states and that those states are in superposition themselves.

keywords: entanglement, superposition, Bell states, quantum information

The most updated version of this paper is available at

<https://osf.io/zjdrm/download>

Introduction

1. [1]
2. This article is an example/application of [2].

^{*}All authors with their affiliations appear at the end of this paper.

[†]Corresponding author: mplobo@uft.edu.br | Join the Open Mathematics Collaboration

The electron

3. Suppose that an electron is in a superposition of space from $x = 0$ and $x = a$.
4. Let $A, B, C, D, E, F, G, \dots$ be points between $x = 0$ to $x = a$.

Entanglement of superposition

5. Conjecture 1: *Two points in space are entangled.*
6. $|AB\rangle = a|10\rangle_{AB} + b|01\rangle_{AB}$
7. $|10\rangle_{AB}$ = the electron collapsed at A
8. $|01\rangle_{AB}$ = the electron collapsed at B
9. The meaning of the first (second) ket is the presence (1) or absence (0) of the electron at a specific point in space.

Superposition of entanglement

10. Conjecture 2: *All pairs of entangled spatial points are in a quantum superposition.*
11. The quantum state of the electron, according to (5) and (10), is then given by

$$\begin{aligned} |\Psi\rangle = & \alpha_1 |AB\rangle_{AB} + \alpha_2 |AC\rangle_{AC} + \alpha_3 |AD\rangle_{AD} + \dots + \beta_1 |BC\rangle_{BC} + \\ & + \beta_2 |BD\rangle_{BD} + \dots + \gamma_1 |CD\rangle_{CD} + \dots \end{aligned}$$

Discussion

12. According to our approach, the mathematical definition of [2] is given by

$$|\Psi\rangle = x_1 |1000\dots 0\rangle + x_2 |0100\dots 0\rangle + x_3 |0010\dots 0\rangle + \dots$$

Final Remarks

13. We presented two conjectures stating that two points in space are entangled and also that all pairs of entanglement are in a quantum superposition.
14. The quantum nature of the interplay between objects and spacetime is somewhere between (5) and (12).

Open Invitation

*Review, add content, and **co-author** this paper [3, 4].*

*Join the **Open Quantum Collaboration** (<https://bit.ly/ojmp-slack>).*

Send your contribution to mplobo@uft.edu.br.

Open Science

The **latex file** for this paper together with other *supplementary files* are available [5].

Ethical conduct of research

This original work was pre-registered under the OSF Preprints [6], please cite it accordingly [7]. This will ensure that researches are conducted with integrity and intellectual honesty at all times and by all means.

Acknowledgement

+ **Center for Open Science**

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The Open Quantum Collaboration

Matheus Pereira Lobo (lead author, mplobo@uft.edu.br)^{1,2}

<https://orcid.org/0000-0003-4554-1372>

¹Federal University of Tocantins (Brazil)

²Universidade Aberta (UAb, Portugal)