Expanding Wormhole Simulation with Majorana Particle

Jihyeon Yoon*(Freelance programmer, flyingtext@nate.com)

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Abstract

Backgrounds: Based on SYK-related models, Majorana particle is a fermion that is its own antiparticle. Recent discovery on simulating traversable wormhole by quantum processor based on Majorana particle is a significant progress in quantum simulation. By adding possible extendable approaches, more possibility could be suggested.
Objectives: Discovering symmetry conservation attribute from Majorana particle to expand its usage for wormhole.
Methods: By applying to the simplified non-unit model, additional considerations for simulating wormhole would be discovered.
Results: Additional considerations of expanding holographic wormhole could be discussed in model.

1 Introduction

Recent discovery on traversable wormhole gives a new chance for revealing attributes of wormhole [1]. Then comes the next question – How to expand wormhole size to the fitting scale to reveal its own attribute within stable simulation? This paper would discuss about what brings setback to the wormhole and how to stabilize it in a simplified model.

2 Understanding Majorana Particle

While the explanation of that study author sets method as an holographic approach by Majorana particle, it's implication on interpretation to be set up as wormhole remains more to be expanded – in size and more.

First of all, Majorana particle has its Hermitian and Clifford relation in SYK model:

$$\text{Hermitian } \psi_i^\dagger = \psi_i$$
$$\text{Clifford relation } \{\psi_i, \psi_j\} = 2\delta_{ij}$$

This could be interpreted in as a quantized but also isolated form in energy operation, which in energy view by spin, being a imaginary-number based potential within observation. Within simplified model [2], "Electromagnetic Gravitational Field" within basis of imaginary number gets product spanning within a field,

*Jihyeon Yoon is a korean medicine doctor. And he is a freelancer programmer also.
Yeongdeungpo-gu, Seoul, 07429,
Seoul, South Korea
ORCiD: https://orcid.org/0000-0001-9610-0994

$$
\begin{aligned}
&Assuming\ that, |E_{Electromagnetic} \cdot E_{Gravity}| \leq \cos\theta \\
\Rightarrow E &= E_{electromagnetic} \cdot E_{gravity} + E_{Weak} + E_{Strong} \\
&= E_{electromagnetic} + E_{gravity} + E_{Weak} + E_{Strong} \\
&\Rightarrow Electromagnetic\ Gravitational\ Field\ by\ \mathcal{B} = \{2, -2, 2i, -2i\} \Rightarrow \langle\mathcal{B}\rangle = Group\ G(\ \cdot\ ) \\
\Rightarrow \langle\mathcal{B}\rangle &\ni Hermitian\ \dagger : \mathbb{C} \to \mathbb{C} \Rightarrow f(a+bi) = a - bi\ ((a+1/2) \in \mathbb{Z}, (b+1/2) \in \mathbb{Z}) \\
&\text{By definition } f \text{ as representation of Majorana particle,} \\
&(a+bi)^\dagger = (a+bi) \\
&\text{And by definition of Span by } \{2, -2, 2i, -2i\} \text{ to Clifford relation,} \\
&\{(a+bi), (n+mi)\} = 2\delta_{a+bi,n+mi}
\end{aligned}
$$

This leads new implication of investigating relation between Majorana particle and the simulation by it. And "Electromagnetic Gravitational Field" as a Majorana particle, which could give a better chance of being utilized.

3 Suggestions

3.1 Stabilizing of wormhole realized with Majorana Particle

As a view of quantum simulation, Majorana particle is a appropriate material for wormhole as a simulation result. But if not simulation but to reality to handle the wormhole, Majorana particle faces a possible challenge of stabilization.

Intuitively, not a simulation but a reality that consists our recognition is by a span of real number. If Majorana particle to be realized, mathematical field span by real and imaginary number should be sustained by following energy-matter conservation mechanism.

For example, as numerical spin aligns in electromagnetic field:

$$
\begin{aligned}
&By\ definition\ \ ||\ a+bi\ || = ||\ a-bi\ || \\
&s.t.\ Partial\ electromagnetic\ spin\ by\ bi = \frac{E_{Weak} + E_{Strong}}{E_{gravity}} \\
&if\ Var(E_{gravity}) \approx 0, Var(E_{weak} + E_{strong}) \approx 0 \Rightarrow Var(bi) \approx 0 \cdot i
\end{aligned}
$$

3.2 Verification of quantum simulated wormhole to be a reality

Equalizing simulated wormhole to reality is essential in an aspect of keeping the result consistent. As for a simulation, machine learning method introduced in article seems reasonable [1]. But as sparse graph network model handles its values in an activation within real numbers minimizing bias, possible considerations of chaining phenomenon toward spin by real-imaginary domain could minimize bias also.

4 Conclusions

1. By stabilizing Majorana particle, more stable and larger size of wormhole could be achieved.
2. Minimizing possible noise of the result network model could lead another finding of attribute of Majorana particle.

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References

[1] D. Jafferis, A. Zlokapa, J. D. Lykken, D. K. Kolchmeyer, S. I. Davis, N. Lauk, H. Neven, and M. Spiropulu, "Traversable wormhole dynamics on a quantum processor," *Nature*, vol. 612, no. 7938, pp. 51–55, Dec. 2022, number: 7938 Publisher: Nature Publishing Group. [Online]. Available: https://www.nature.com/articles/s41586-022-05424-3

[2] J. Yoon, "Nuclear Fusion Framework for Simulating Universe," Nov. 2022. [Online]. Available: https://www.techrxiv.org/articles/preprint/Nuclear_Fusion_Framework_for_Simulating_Universe/21549351/1