Fuzzy Space?

FARZAD DIDEHVAR

Amir Kabir University (Tehran Polytechnic)

10/6/2021

Abstract. In the sequence of articles [1],...,[14], we consider Fuzziness of Time. What about space? Should we consider Fuzzy Space? What would be the Structure of the Physical world? Here we try to shed a light on this subject.

KEY WORDS: Fuzzy Time-Particle interpretation of Quantum Mechanics, Fuzzy Space, Space independence, Big Bang, Void

Introduction

In [1], [2], [3], [4], [5] we introduce Fuzzy time and Fuzzy time-particle interpretation of quantum Mechanics. In [6], we show fuzziness of time and the interpretation is experimentally verifiable. All the story and idea stems from applying paradoxes to shed a light on P vs NP problem. More specifically, we use Unexpected Hanging Paradox [7], [8], [9], [10], [11].

To resolve this paradox, we assume Fuzzy time as it is mentioned in [1].

What about Fuzzy Space? At the first step, we try a similar approach as the approach we have for fuzzy time. The author attempts to find a similar paradox for fuzzy space is failed right now. Hence, one of our major question here is

Is there any way to approve the fuzziness of space?

We have an experimental way to find fuzzy time and the related fuzzy function [6].

To the best of the author's knowledge, either this experiment or similar experiments are not done. We will discuss about a similar experiment later.

Explanations

To continue the above discussions, in order to answer the above question, we consider different possibilities:

1. Time is not Fuzzy. So the Fuzzy Time-Particle interpretation is not a convenient interpretation for quantum Mechanics. But some of our theoretical results remain valid [12], [13], [14].
2. Time is Fuzzy and by experience the instants of time are found and it adopts to "Fuzzy Time-Particle interpretation" of quantum Mechanics. Good Luck! For this interpretation.

3. Finally, the case that needs more discussion, the controversial one. Time is Fuzzy and by experience the instants of time are found but it doesn't adopt to "Fuzzy Time-Particle interpretation" of quantum Mechanics. We need a more precise discussion here.

In the experiment Proposed in [6], to prove or reject whether time is a fuzzy concept, the space is considered a classical concept, as an assumption.
When we calculate the distances, in any possible experiment of this type we have this presumption. Actually, what is proposed in [6] is a type of experiments not simply an experiment. It is an unwritten assumption which we didn't mention there! Actually, the instants of time are calculated when we assume space is not fuzzy but it is classical.
It means by changing our assumption our result possibly would be changed.
Now, by considering space a classical one and considering the discussion in [1] to calculate the instants of time by Schrodinger equation. So in this case, either we should reject this equation (It seems so unlikely) or we should reject our specific assumption, classical space.
If the third case comes true experimentally, we face a very interesting and much complicated situation, to understand Space-Time structure of the world. In this case, the results and our understanding of the structure of space will change. (When time is Fuzzy but not as we expected in the second case).

Nevertheless, even in the above and the second case we will have complexities which should be discussed.

Space independence

To explain more the situation, we should reconsider the equations mentioned in [1]. About this equation, we have some consideration and hypothesizes that seems us rational in some degree. We list these hypothesizes, as following
1. Space independence.
2. Space is symmetric.

We explain and define them in below

1. Space independence.
In equation

$$X(t,x,y,z) = \int_{z=-\infty}^{z=+\infty}\int_{y=-\infty}^{y=+\infty}\int_{x=-\infty}^{x=+\infty}\int_{t=-\infty}^{t=+\infty} X(x-x',y-y',z-z',t-t',)f(x-x',y-y',z-z',t-t',)dtdxdydz$$

f is a fuzzy number associated to t in (x,y,z), as it is explained in $t \in abs$

(abstract time) [6].
By space independence, we mean f(t,x,y,z), the fuzzy time function associated to x,y,z, is independent of x,y,z, equivalently the functions doesn't change respect to a shift in the space.
The modified version of *space independence* would be:
In sufficiently large part of space, the function f remains constant. $f(t,x,y,z) = f(t,x',y',z')$

That shows the homogeneity of space, in this regard. It is very unlikely this assumption would be failed. Nevertheless, if so, the structure of time and space changes drastically. We will see the result by Physical experiments.
By this assumption, we refute the 1 & 3 assumption. That is a proof for "Fuzzy Time-Particle interpretation" of Quantum Mechanics.
Nevertheless, it is possible that space would be fuzzy. More exactly, under the above assumption these two claims (Time is a fuzzy concept and space is a fuzzy concept) are independent. Consequently, we need a Physical experiment to determine the situation; we discuss about in the next chapter.
Mathematically, by the above consideration we face a system of equations with an integral equation, as following

$$1. X(t,x,y,z) = \int_{z=-\infty}^{z=+\infty}\int_{y=-\infty}^{y=+\infty}\int_{x=-\infty}^{x=+\infty}\int_{t=-\infty}^{t=+\infty} X(x-x',y-y',z-z',t-t',)f(t-t',)dtdxdydz$$

$$= \int_{t=-\infty}^{t=+\infty}\left(\int_{x=-\infty}^{x=+\infty}\int_{y=-\infty}^{y=+\infty}\int_{z=-\infty}^{z=+\infty} X(x-x',y-y',z-z',t-t',))f(t-t',)dxdydz\right)dt$$

$2. X = \psi$

$3.\ i\hbar\frac{\sigma}{\sigma(t)}\psi(\vec{r},t) = \left[\frac{-h^2}{2m}\nabla^2 + V(\vec{r},t)\right]\psi(\vec{r},t)$

First we solve the third equation to obtain ψ and by the first equation we find $f(t)$.

In brief, the space independence hypothesis conclude Fuzzy time and Fuzziness of space are independent. Hence, Fuzzy time should be checked independently based on experience as it would be explained in the next chapter.
2. If space is symmetric, we have no special direction. It seems rational, but it is very possible that on the contrary, we find some specific special directions. It is certain that finding these hypothetical direction is very interesting and important, if there is any.

By considering Big Bang Theory, in the case that there is (or better to say, there was) a special direction (or there are special directions), we expect that some heterogeneity exists in the space, possibly in that direction (Those directions).

The very possible example is Void in cosmos (Great Nothing, right ascension 14h 50m and declination 46^o

The possible explanation is when big bang event happened. It is possible that in some directions we have more turning back in time (because of the asymmetry of f), at the time of big bang. So, when the matter scatter again, in that directions, we have less matters! (This is the simplest explanation, it might be we have more complicated explanations, later. But the problem and the complexity is, even when f is symmetric there is a possibility of asymmetry of space).

It is notable to mention, as it is explained in [3], in our modified version of big bang we have no singularity point.

Experiment either to prove or reject the Fuzziness of space:

Analogues to the experiment for time [6] we could have an experience about Fuzziness of space in any direction. The difference is our hypothesis about time. Here, we could start from classical time, but surely the best hypothesis is to consider "Fuzzy time- Particle interpretation" of Quantum Mechanics. Then similar to [6], we are able to find out supposed fuzziness of space in that direction.

Is this a Contradiction?

At the first glance, it seems that we face a contradiction in the above. Let we explain the supposed contradiction.

In [6], we consider space classical and based on that as our desired possibility and wish, we prove experimentally time is a fuzzy concept. Then by above experiment we check whether space is a fuzzy concept or not. But we start from classical space as a hypothesis. Is our argument contradictory?

Actually, we didn't explain well the process in above sentences. The complete explanation shows that we have no contradiction. The steps of our argument is as follows

First we consider space a classical concept.
In the second step, based on the above hypothesis we do our experiments [6] to prove whether time is a classical concept or not.
In the third step, the condition that "Particle-Fuzzy time interpretation of Quantum Mechanics" is established plus space independence of time. In this condition, the fuzziness of time and the fuzziness of space are independent concepts. Equivalently, we need not to consider fuzzy space as a hypothesis, nevertheless it could be so. To verify that, we should do some new experiments.
Two case are much complicated than above, as listed in below:
The first: time is fuzzy but not as we expect in Fuzzy Time-Particle interpretation.
The second case is when we have not "space independence" hypothesis.

Conclusion. We suggest that space independence or at least its modified version is true. If so, in our interpretation we needn't to consider fuzziness of space. However, it could be true, independently. Obviously this claim, is checkable experimentally.

In the case that the experiment reject the space independence hypothesis, we are going to rebuild a much complicated Mathematical structure (An opportunity!)

In this case, we have different possible structures for fuzziness of time and fuzziness of space.

The next probable hypothesis is:

1.Space-Time independence

$$f(x, y, z, t) = G(f_T(t), f_s(x, y, z)$$

We can imagine the other conditions for some special directions, for example:

$$f(x, y, z, t) = G(f_{T,x}(t, x), f_1(y, z)$$

But it seems unlikely.

3.Total non-independence.

None of the above conditions are established.

That could equivalently explain our world. We haven't unique explanation of the world as we had under " space independence" hypothesis.

Therefore, in any case the ways are open theoretically to different theories, we need experimental conclusions to choose the best one.

(There are attempts for fuzzy space –time. Some of them are presented as drafts and journal articles ….).

References

1. Didehvar F, "Fuzzy time", a solution of Unexpected Hanging Paradox (A Fuzzy interpretation of Quantum Mechanics), Philpapers, 2019-04-13

2. Didehvar F, About Fuzzy Time-Particle interpretation of Quantum Mechanics (it is not an innocent one!) version one, version one, Philpapers 2019-9-13

3. Didehvar F, Singularities, About Fuzzy time-Particle interpretation of Quantum Mechanics(It is not an innocent one!), version 2, Philpapers 2019-12-13

4. Didehvar F, Double Slit Experiment About Fuzzy time-Particle interpretation of Quantum Mechanics (It is not an innocent one!) Version 2, Philpapers 2019-12-19

5. Didehvar F ,"Fuzzy Time", from Paradox to Paradox (Does it Solve the Contradiction between Quantum Mechanics & General Relativity?), Philpapers 2019-04-18

6. Didehvar F, Does Accepting Fuzzy Time Particle Interpretation of Quantum Mechanics, Refute the other Interpretations? (Is Fuzziness of Time Checkable Experimentally?), Philpapers 2021-09-04

7. Didehvar F, Is Classical Mathematics Appropriate for Theory of Computation?, Philpaper 2019-04-14, vixra 2017

8. Didehvar F, Is Classical Mathematics Appropriate for Theory of Computation?, Philpaper 2019-04-14, vixra 2018, Handbook of the 6th World Congress and School on Universal Logic, vichy, 2018

9. Didehvar F, A Semantic Without Syntax (Non aiomatizibility of Theories), arxive 1506.08221.pdf

10. Didehvar F, A Semantic Without Syntax (Non aiomatizibility of Theories), Istanbul, Unilog 2015, Hand book of 5th World Congress and School on Universal Logic, June,20-30, 2015

11. Didehvar F, When proof doesn't show the Truth, Paradoxes Part one, , Philosophy: Theory and Practice, Proceedings of the International Congress of "The World Philosophy Day 2010, Tehran; November 20-22/2010, Iranian Institute of Philosophy

12. Didehvar F, A Contradiction and P=NP problem, Philpapers 2015

13.Didehvar F, P≠NP By accepting to make a shift in the Theory (Time as a Fuzzy Concept Concept), SSRN, 2021 (HAL, Philpapers 2021)

14. Didehvar F, TC+CON(TC*) Deduce P is not Equal NP, Philpapers 2020