Fuzzy time and the possible impacts of it on science [1]

Does accepting Fuzzy Time-Particle interpretation of Quantum Mechanics, refute the other interpretations?

(Is fuzziness of time checkable experimentally?)

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Throughout this paper, in a nutshell we try to show a way to check Fuzzy time in general and Fuzzy time-Particle interpretation of Quantum Mechanics, experimentally.

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One possible approach to investigate on long standing problems in Complexity Theory is logical ways, besides Combinatorial and Probability Theory ways. One of the logical ways is based on the definitions of B. Poizat [1], a generalization of the Complexity Theory concepts in arbitrary structures in Model Theoretical sense. There are many attempts in this approach by people like P. Koiran. In origin it is based on the works of (L.Blum, M.Shub, S.Smale, and F.Cuker)[2],[3]. The author started the research on this subject from this (around 1999). Approaching P vs NP problem in its original form seems so hard from this way, and the structure which is known in this field are much more rigid to find a way through them, for the main problem. The author learned and studied Computability Theory mainly by people in Russian school (M.Arslanov, A.Morozov, S.Goncharov), as the first step of studying in Theory of Computation (around 1993-1998 Approximately).

For so many years, the author has tried in this way and unfortunately no real achievement for the main problem. Seemingly, some others have tried similar way but the structures were not simple to work and the technics are not repeatable from one structure to the other. So the question is, What about the other possible logical ways and views?

One of the most important and Fundamental Classical Theorems in Logic is incompleteness of Gödel. The idea behind the proof is employing the paradoxes, more specifically liar paradox and Bertrand Paradox. Is it possible to have a similar idea, to shed a light on P vs NP question? That is the turning point question which the author reached, around 2010. Approximately the time that V.Deolalikar has given his proof. We remember well the shock of his proof and the possibility of its truth. Anyway, neither Deolalikar proof and not any other proof has been accepted yet, although some of them were scientific and elaborate articles. There is a list of these attempts in [4].

What was surprising is not the P vs NP problem to the author. The most surprising was, a problem like P=PSPACE has not been solved yet. What is the problem with this problem?! P=PSPACE shouldn't be a hard one. But it is! It is an unsolved one.

It comes in mind that the Complexities of P vs NP problem should be in depth and in foundation. So, possibly the essence of problem and solving it, is not in Combinatorics and Probability but in Logic,

that strengthen our point of view in above Paragraphs. I remember well the time that as a youngster I studied the problem P=PSPACE and I have supposed to be able to solve it in one or two weeks. Of course, there was no success about, even in months and years.

If we wish to follow the idea of Gödel Incompleteness as one of the major ideas in logic, seemingly we should find and employ a suitable Paradox. By overviewing and checking the list of paradoxes, Unexpected Hanging Paradox seems a good choice. Roughly speaking and in brief, the similar important elements in Theory of Computation repeat here, like time, step wise Computing and states.

In [5], [6] the attempts in this way is shown. Actually, in order to have a more exact and Mathematical result, we need to change and modify the paradox as in [5],[6]. There, we see that by some modifications, we face a contradiction not a paradox. Forthcoming, the author considers this possibility that we do not accept this point too, since usually there is a large inertia to accept these type of information even if we have proof for them. The point is presented in [12].

1. By accepting the above claim and proof, we try to resolve the contradiction. Two major ways come in mind. Changing the logic which rules our subject and changing the concept of time. Both are changing the fundamental concepts. By considering time as a Fuzzy concept as it is shown in [7] the paradox and contradiction would be resolved. There are the other ideas to support the fuzziness of of time [8]. More exactly, we consider the instants of time as Fuzzy numbers [9], [10].

About logical way, employing Paraconsistent Logic and Intuitionistic Logic are two possible ways.

2. In the case we resist the above claim about the contradiction, we are able to prove the problem P vs NP as it is shown in [11]. Here, we have Theory of computation by considering time as a Fuzzy concept, we name it TC*. By considering TC* as a consistent theory, we are able to prove P vs NP as it is shown in [11]. A summary of the results is in [12].

Actually this approach to author, is a branch of a tree, a tree of attempts by author to shed a light on P vs NP problem, with many branches as failure.

Evidences for Fuzzy Time

Time is a Phsical concept. When we call time as a fuzzy concept, in a more exact sense it means in the associated model of reality we consider time as a fuzzy concept. Actually, in a more abstract level we have the concept of time similar to the classical model. Moreover, we are able to define the fuzzy time based on this new concept. Actually, we push the known concept of time in a more abstract situation and level.

To compare these situations, we have the following picture

1. Abstract time as real numbers

   Reality

2. Abstract Time as Real Numbers

   Fuzzy Time

   Reality

In the first picture, we try to describe and explain the reality based on the abstract time. In the second picture, we try to explain the reality based on Fuzzy Time and in return the Fuzzy time itself is explained based on Abstract time. We have a Theoretical shift here, from Picture 1 to picture 2.

Based on Fuzziness of time, we are able to purpose a new interpretation of Quantum mechanics named by "Fuzzy Time-Particle interpretation of Quantum Mechanics" [13], [14]. In sum, in this interpretation we have only particles and if in some experiments they appear to be wave it is just because of Fuzziness of time. Articles in [13], [14], [15] show how it is possible to solve some problems in Physics by considering this interpretation.

After all, the major question is

" Is there any experiment either to support or reject Fuzziness of time and Fuzzy Time–Particle interpretation?"

In below, the above question is answered positively.

Suppose we have two Physical and repeatable events A and B as cause and effect, (by considering Fuzzy time- particle interpretation, the difference between happening times is presented by t otherwise t, that should be small enough). Now by applying an exact Clock (Atomic Clock or Quantum Clock) we compute the time difference of events A and B, experimentally. We call this experience "Basic experience". These clocks have some precision. In a large number*

of repeating this experience (For a large number N) in rare events A happens after B (n).

We call this experience, "Experience 2". For large enough number S, we repeat S times experience 2. In experiment i, 1<i<s in n_i *"basic experiment" B occurs before A. We have a distribution of* $^{n_i}/_{N}$ *, we call it distribution 1.*

If we do not consider time as a fuzzy concept, due to the precision of our Clock we will have a non-zero distribution, call it distribution 2.

If these two distributions are significantly different, then time is a fuzzy concept based on this experience, otherwise the experience rejects Fuzzy time-Particle interpretation.

Moreover, in the case that time is fuzzy, by employing more knowledge of Statistics, we are able to find fuzzy numbers associated to time instants.

In this case, the question would be:

"Do these Fuzzy numbers and Quantum Mechanics support each other under the interpretation?"

If the above question has a positive answer, it will support the Fuzzy time-Particle interpretation and will reject the other listed interpretations of Quantum Mechanics.

In above experiment, t or t should be sufficiently small and N should be sufficiently large number.*

So it seems fuzziness of time experimentally could be checked

The point that Fuzziness of time could be checked experimentally, is a very central point.

" In the existed list of Quantum interpretations, by the experiment we put aside either this interpretation or the others".

A question and the final word:

Consider the flying balloon over Antarctica (ANITA anomalies) experiment and the neutrino anomalies related to it. Is it possible this anomaly happened because of turning back in time caused by Fuzzy time?

In the above experiment, it appears to us that cosmic ray come from ice to sky. It might be explained because of turning back in time caused by Fuzziness of time.

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