

The Movement of Time Occurs Due to Deformation of Space. Is Time Travel Really Possible? Can We Have Time Machine?

Prasenjit Debnath

PhD Student, NIT Agartala, India

Abstract: *The most complex, illusion and deceptive concept of human race is the physical time dimension. If the theory of relativity is correct, the physical time has only single dimension and also the physical time has a shape. Although we can represent time as two-dimensional representation with positive part of imaginary axis of time represents the amount of time dilation with respect to the reference frame and the negative part of the imaginary time axis represents the time advancement with respect to the reference frame. Our view of the nature of the physical time has changed over the years. Each time, an extraordinary scientific breakthrough reforms the concept of the physical time radically with some new ingredients in it. With the discovery that light speed is always the same, a constant of 3,00,000 kilometers per second or 1,86,000 miles per second, for any observer, does not matter that the observer is stationary with respect to the reference frame or moving toward or away or have sideways movement from the source of light. This led to the theory of relativity and thus, abandoning the concept of unique universal absolute time replaced by the relative time (time as personal concept) which is an observer dependent reality i.e. each observer has its own measure of time, according to the theory of relativity, as recorded by a clock that the observer carried with him and the clocks carried by different observers will not necessarily agree about the time of occurrence of an event. Thus, the physical time becomes a more personal concept related to the observer who is measuring it. Still, the physical time is treated as a single railway track that moves forward only by the theory of relativity, very similar to the concept of a unique absolute time by the classical Newtonian physics. What if the railway track has loops and branches? So, a train could go forward and comeback to the station that it left earlier. In other words, someone can travel in time to the past or the future. Once these concepts were treated as science fictions, now become science facts like design of a submarine or travel to the moon were science fictions earlier, but now science facts. So, is the time travel really possible? What are the prospects of the time travel? Can we build a time machine that will allow us for the time travel? Is time travel possible in both forms-to the past and to the future? Is time travel possible in both cases-macroscopic structure and microscopic structure of the Universe? What must be the essential properties and ingredients of a time machine? How to address different methods in building a time machine? Is a space ship can be treated as a time machine when it travels close to light speed? Can we travel faster than light speed? Can we have unlimited speed, if any? The long standing quests need to be addressed to be forward in understanding the mysterious physical time. The mysteries need to be resolved to step further.*

Keyword: The time travel, a time machine, the theory of relativity, unique universal absolute time, personal concept of time or relative time

1. Introduction

The nearest neighboring star of the solar system is Proxima Centauri or Alpha Centauri C which is four light years away from us which means that it will take at least eight years to return from Alpha Centauri C if the traveler travels at the light speed [1, 2]. If the expedition were to the center of the galaxy, it would be at least a hundred thousand years before comeback at the light speed because the Milky Way is a barred spiral galaxy that has a diameter usually considered to be roughly 100,000 to 120,000 light years and one journey of our solar system (travelling at a speed of 4, 83,000 miles per hour) around the center of the Milky Way galaxy (also sometimes called a cosmic year) is around 230-250 million years [3, 4]. So, the solar system is roughly around the same place of the galaxy after a cosmic year when dinosaurs first appeared in the Mesozoic Era of 245 million years ago [5, 6] and they sustained for 180 million years as indicated by the fossils of oldest dinosaurs discovered from the rocks of Argentina and Brazil [7]. We could hardly imagine to go round the Universe because we see only 5000 stars in the sky with naked eye which is 0.0001% of the total star in just our own spiral galaxy [8], The Milky Way which is one of the hundred billion galaxies in the observable Universe [9] that can be seen by modern telescopes and each galaxy contains on average some one hundred billion stars and that puts us really in a bad shape to go round the Universe. According to

the theory of relativity, it is possible to travel to the future- it is possible to build a time machine that will jump us forward in time [10]. Since space and time forms space-time, according to the theory of relativity, a time machine is also a space ship which has to travel close to the speed of light to travel to the future, nothing can exceed the speed of light [11, 12], in other words, the speed of light is the universal speed limit of the Universe [13]. There is a problem with breaking the speed-of-light barrier [14]. The theory of relativity says the power needed more and more to accelerate a space ship that approaches closer and closer to the speed of light. We have experimental evidence of that in the European Center for Nuclear Research (CERN) or Fermilab; not with the spaceship but with the particle accelerator, we accelerated particles to 99.99% of the speed of light, but no matter how much extra power we put in, could not cross the barrier of the speed of light [15]. According to the theory of relativity, we need to travel faster than light for backward time travel to the past [16]. Because particle cannot move faster than light, no matter how much power we put in the particle accelerator, we have to abandon the idea of unlimited speed and backward travel in time [17]. That is the reason why no time traveler of future has not come to their past to visit us [18]. Present is very relative abstract idea. For the visitors of future, the present is the very well-known past for them. For very far future visitors, near future is well known past. Knowledge is a function of the physical time; it is kind of an

accumulator that gathers information with time. The future visitors might have good knowledge about the time machine; knowledge is ever increasing in proportion with the physical time. The knowledge about the time machine can be allowed by nature only to that time which is permitted for human race or any other advanced race, if any. So, the visitors can never come to visit us to reveal the information about the time machine until the present time comes to them to acquire the knowledge which can be termed as 'appropriate time'. Travel to the future is also not allowed, if it would be Napoleon Bonaparte or Adolf Hitler would have visited us. Since the Big bang, the curvature of the space-time is not that great to form a loop, if it would be, we would have arrived to the past that we already left before through the loop. The only feasible hope for us to travel in time is a space ship and the speed of light. We want to use the speed of light as reference to travel in time through a space ship which implies that we have enough knowledge about space at least on the local scale, but not enough knowledge about time, if it would, we would try to build a time machine as a function of time only, not a space ship. We know mass energy conversion process through the Albert Einstein's famous equation-

$$E = mc^2$$

Where E represents the Energy
 m represents the mass
 C represents the speed of light

But we do not know yet the space and time conversion process with proper mathematical equation. We do not know yet the dimension of space, we know only how to locate an object in space with three dimension i.e. length, width and height. And we know to represent a time with single dimension only. If we resemble mass energy conversion process to space- time conversion, we should have an equation like-

$$S = KT$$

Where S represents the space
 T represents the physical time
 K represents the proportional constant of space and time conversion.

2. On The Space-Time

Space is not uniform everywhere. A particle is a deformation of space. The different states of matter are nothing but different deformations of space. When space is squeezed, it forms a particle. The particle with least squeeze displays gaseous form, a further squeeze of space converts the gaseous form of the particle to liquid form, for example of liquid form from gaseous is LPG-liquid petroleum gas. A further squeeze of space will make it a solid form. The Universe, as we see, is nothing but uneven distribution of space. A space at rest or relaxed is nothing but that contains no mass and no energy in it. The time is absolute zero there, in other words, the physical time has no meaning in the relaxed space. A little squeeze of space locally somewhere will display energy content in it; a further squeeze of space

will form particles. A black hole is the most squeezed form of space, thus it has highest density possible; in general, as we do not know the categories of black holes according to the density variations, we left it to abstract infinite density. As a particle consists of pure mass and energy in it (like Earth with gravitational energy-which has both pure mass and energy in it). The space deformation that forms a matter must have some energy content that displays gravity and time dimension (energy) in it. So, relaxed normal space without any deformation (with respect to reference frame) does not have any time concept in it. It is the deformation or deviation of space that displays as energy, gravity, time, and particle etc. As time is directly proportional to the space deformation; the more squeezed space displays particles and time dilation, i.e. time runs slower under the influence of energy and particle. That is the reason time runs slower in the Earth compared to free space. Space travel is always uniform, but because in some regions of space is squeezed; it took longer time to travel a short distance in space due to the deformation of space. Time is always universally forward for our Universe, but it runs at different speeds at different regions of space because of different space deformations; in other words, the density variation of space makes time to run at different speeds at different places in the Universe. Suppose the distance between two points-point A and point B is d and time taken to travel at a fixed speed such as speed of light from point A to point B is τ , if the Point A and point B come closed due to squeezed space, with the same speed the time taken to travel from point A to point B took the same time τ , the observer like human being, it seems to us that time runs slow.

$$S' = KT'$$

Where S' represents squeezed space or deformed space

T' represents dilated time. Actually it took the same time to reached the points in a squeezed space, because the points are nearer now because of space deformation, it seems to us that time runs slower in the deformed space. Thus, time dilation is directly proportional to the deformation of space, the more the space is squeezed, the slower the time runs.

3. On The Space Fabric

A space is like a mosquito net. With normal fabrication it does not contain any energy or particle in it. For example at absolute zero, the matter displays no heat energy in it. It is relaxed normal space, in other words, the space is at absolute rest or relaxed can be treated as reference frame. The physical time has no meaning in that fabrication of space. The physical time takes birth on deformation in the fabrication of space. A more relaxed space with respect to the reference frame displays negative energy or anti-particle, the physical time runs backward direction in that condition. Thus anti-particle, anti-body, Anti-Universe runs in backward in time, our definite history is their probabilistic future, assuming that they have same disability to anticipate their future like us and our probabilistic future is well known history for them. If the space fabric is less relaxed or stressed, it exhibits positive energy, positive mass, The Universe we live in. And the physical time runs in the forward direction for our universe. The anti-Universe's

definite history is our probabilistic future and their probabilistic future is our well known history. Thus both history and future are both predefined and preordained.

4. On The Psychological Recognition of the Physical Time

As future is unanticipated by us, any event that occurred has a specific trend of recognition by the human psychology [19, 20], like most likely to be as happened or least likely to be as happened or unlikely to be as happened or highly unlikely to be as happened etc. For the physical time, it is option less or only likely to be as happened. Might be the portion of our brain that is responsible to interact with future is the unconscious mind, which is disabled by birth, the reason why we cannot anticipate the futurity. Some people, it is believed that, some portion of the unconscious mind can convert into subconscious mind and they see the future events as dream which they find replica of that in the real world in the conscious mind in future.

5. Is Time travel Really Possible?

With the severe disability of our brain to anticipate futurity, any futuristic comment or conclusion is not a safe option for us [21, 22]. As past is definite, time travel is not possible in the past. Because future is unanticipated probabilistic for us, whether time travel to the future is possible or not, only future can answer it, so we leave future, although definite, as future as it is. Although preordained, let's hope for the best of our unanticipated future about our existence and survival.

6. Is Time Machine Is Feasible?

We are comfortable in working with space only, not time [23]. So, if we use a space ship as time machine, time travel might be feasible [24]. Otherwise, without proper analysis of the characteristic of the physical time and some scientific breakthroughs on the physical time, everything looks in a very bad shape with the time machine. But because future is preordained and predefined, we must leave everything to the future to observe later what future allotted for us. But time travel with a spaceship seems not a good idea at least in terms of the gain or profit for us. We need something that is a pure function of time and also it has capability to change the course or speed of time as well.

7. Conclusion

Time travel to the past is impossible, because since Big bang, the curvature of time is not that great to form a closed loop so that we can arrive at the time that we already left before. Time travel to the past is strictly prohibited by the causality. The cause and effect relationship of successive events or in other words, the causal structure of the time prevents to penetrate past. Thus past is unaltered, predefined, definite and preordained. That is the reason no body from future came to meet us. Future time travel is also the replica of the past, as future is the time reverse scale of past, thus the futurity is also predefined, preordained, fixed. The time travel to the future is also strictly prohibited because of anti-causal structure of successive events. The anti-causal

structure is the reverse of the causal structure. Causality relates past with future and the same way, anti-causality relates future with past. If past is responsible for the future as it is, the future is also responsible for the past as it is and vice versa. But psychological recognition of future seems to be probabilistic as we have severe disability to anticipate futurity. If there is any scope of building a time machine, seems to be highly unlikely, only psychological probabilistic future can answer it to us at some time at future can be termed as 'appropriate time' which is allowed by nature to disclose information at the right time only.

Acknowledgment

I cordially admire **Dr. Aparna Nath**, Associate Professor and my PhD Guide, The department of Physics, National Institute of Technology, Agartala, India, for the epitome of inspiration and motivation to write this particular paper with perfection and accuracy. I am extremely thankful to her from all possible help she made to write this paper. Also I am thankful to The Department of Physics of National Institute of Technology Agartala (NIT Agartala) for proper conduct and coordination.

Reference

- [1] Stephen Hawking, "A Briefer History of Time", Bantam Books, London, pp. 1-125.
- [2] Stephen Hawking, "Black holes and Baby Universes and other essays", Bantam Press, London 2013, ISBN 978-0-553-40663-4
- [3] Stephen Hawking, "The Grand Design", Bantam Books, London 2011
- [4] Stephen Hawking, "A Brief History of Time", Bantam Books, London 2011, pp. 156-157. ISBN-978-0-553-10953-5
- [5] Stephen Hawking, "The Universe in a Nutshell", Bantam Press, London 2013, pp. 58-61, 63, 82-85, 90-94, 99, 196. ISBN 0-553-80202-X
- [6] Stephen Hawking, "The Beginning of Time", A Lecture.
- [7] Stephen Hawking, "Stephen Hawking's Universe: Strange Stuff Explained", PBS site on imaginary time.
- [8] Stephen Hawking, "How to build a time machine", 27 April, 2010.
- [9] Uno Ingard, K "Fundamental of Waves & oscillations", Cambridge University Press. P. 38, ISBN-0-521-33957-X Oxford: The British Academy, 1999
- [10] A. Zee, "Quantum Field Theory in a Nutshell", Princeton University Press, 2003
- [11] Storrs McCall, "A Model of the Universe", Oxford: Clarendon Press, 1994
- [12] Craig Callender, "Time, Reality and Experience", Cambridge, UK: Cambridge University Press.
- [13] Craig Callender, "Thermodynamic Asymmetry in Time", The Stanford Encyclopedia of Philosophy (Spring 2002 Edition)
- [14] Storrs McCall, "A Model of the Universe", Oxford: Clarendon Press, 1994
- [15] Robin Le Poidevin and Murray McBeath, "The Philosophy of Time" Oxford: Oxford University Press, 1993
- [16] Newton-Smith, W.H., "The Structure of Time". London: Routledge & Kegan Paul, 1980.

- [17] Barry Dainton, "Time and Space", Ithaca: McGill-Queen's University Press, 2001
- [18] Robin Le Poidevin, "Questions of Time and Tense", Oxford: Oxford University Press, 1998.
- [19] Nerhlich, Graham, "What Spacetime Explains". Cambridge: Cambridge University Press, 1994.
- [20] Sklar, Lawrence, "Space, Time, and Space-time", CA: University of California Press, 1974.
- [21] Whitrow, G., "The Natural Philosophy of Time". Oxford: Oxford University Press, 1961. (2nd edn., 1980.)
- [22] S.W. Hawking, and G.F.R. Ellis, "The Large Scale Structure of Space-Time", Cambridge University Press, (1973).
- [23] Stephen Hawking, "A stubbornly persistent illusion-The essential scientific works of Albert Einstein", Running Press Book Publishers, Philadelphia, London 2011.
- [24] Flynn, John L, "Time travel literature", on 29-09-2006

Author Profile



Prasenjit Debnath, born in Agartala, Tripura, India on 15th of March 1979. I am pursuing a PhD degree in the Department of Physics in National Institute of Technology Agartala (NIT Agartala), India.