SPACE-TIME AND TIME-TRAVEL

Bertrand Wong, Eurotech, S'pore Branch, Email: bwong8@singnet.com.sg

Abstract

Time is actually an abstract entity which became part of Special Relativity. There has in fact been postulation that time is unreal but just an invention of the intellect. Whether time is an invention or actually real, it cannot be denied that it plays a very important role in our lives, e.g., without a watch to tell us the time practically all of us would be lost in time. This paper takes a look at the philosophical ramifications and difficulties of time, as well as time-travel, and clarifies things.

Space-Time Continuum

When Einstein first propounded the concept of the space-time continuum (which implies the possibility of time-travel) in general relativity there were critics who scoffed at this revolutionary idea, which posits the existence of four dimensions in the universe: the three physical dimensions of length, breadth and height, plus the fourth dimension of time; they could not conceive time as the fourth physical reality, they could not understand the relativity of time.

What is the actual problem with time? The problem is that while the three dimensions of length, breadth and height are physical and visualisable, the fourth dimension of time is abstract, intangible and not possible to visualise; any object could easily be physically observed or seen moving or traveling along any of the three physical dimensions of length, breadth and height, and, even along all three of these physical dimensions simultaneously (which could be described by a vector diagram, utilising vector analysis), but it is not possible to physically observe or see an object move or travel in the time dimension, i.e., one could use a ruler to physically measure or gauge the length, breadth and height dimensions but it is not possible to use a ruler to physically gauge the time dimension. However, the time dimension is directly related to the length, breadth and height dimensions - moving or traveling along any or simultaneously all of the three dimensions of length, breadth and height from one point to another point in space requires a certain amount of time which depends on the velocity or speed of movement or travel, this amount of time could only be measured or gauged by a clock or watch. As the three dimensions of length, breadth and height are physical, tangible, visible, concrete, while the time dimension is not physical at all and is strictly intangible, abstract (time is strictly an abstraction), we should not regard or treat the time dimension as similar to the dimensions of length, breadth and height. It is apparent that the confusion caused is due to us treating the non-physical time dimension as similar to the physical dimensions of length, breadth and height, i.e., treating non-physical time as physical (giving rise to the absurd speculation about (physical) time-travel as well). This is actually a philosophical difficulty and should first be tackled. However, movement precedes time, the latter being the measure of the former.

The concept of Einstein's space-time continuum seems to go against common sense. If time is the fourth dimension, can we move or travel in the time dimension as we can do so along the three physical dimensions of length, breadth and height - many appear to think we can? As per the reasons stated just above, this is clearly not possible. Can there be more than four dimensions in the universe? Kaluza, e.g., had modeled a universe with 21 dimensions, reducible to 11 dimensions, a universe which could be described physically in five dimensions. Einstein found his idea elegant and encouraged its publication.

Einstein's concept of time as the fourth dimension of the universe may be "interpreted" in a way which makes more sense (which implies subjectivity) although some people cannot accept it as sensible because time to them is abstract, intangible, and lies outside our physical senses. If a person, e.g., were to enter a completely dark room, whereby he could not see anything at all, and hence, any movement, we can say that he could not see time (passing), and would lose his sense of time. But when there is light, and he could see movement (even the movement of sunlight, moonlight and day and night), e.g., he could see the hands of a clock moving, he could see the points in space, he could see people and objects moving from point to point in space, he could "see" and is in fact "seeing" time (passing), "seeing" here is "sensing" rather than physically seeing, bearing in mind that time is actually intangible and cannot be physically seen or handled as though it were a solid, a physical, a tangible, object. (Here it invokes the question of how time-travel is ever physically possible, though mentally or consciously it is possible - to travel to the past just think of the past and to travel to the future just think of the future.) This gives rise to another philosophical point, viz., the presence of light, which results in visibility and the physically observing or seeing of movements, is necessary for the existence of time (the sense, awareness, consciousness or idea of the passing of time), i.e., light is necessary for sight (we cannot see in the dark), which in turn is necessary for the existence of time (sensation, awareness, consciousness or idea of the passing of time due to the observing or seeing of a physical object moving from point to point or location to location in space). This is an important point to note.

Movement, any movement from point to point in space, e.g., a person's or object's movements from place to place, the earth's orbit round the sun and the orbits of the other planets, is analogous or equivalent to the fourth dimension of time (each of these movements takes a certain amount of time to complete, time which could be measured or gauged only with a clock or watch) - movement is therefore the equivalent of Einstein's fourth dimension (i.e., time) - movement could be translated, or, transformed into time. Hence, Einstein's continuum of the four dimensions of length, breadth, height and time, i.e., his space-time continuum, is equivalent to the length, breadth, height and movement continuum which is visualisable, as movement is tangible, observable, seeable, unlike time.

Time could in a (subjective) way be looked upon as a physical reality and not as a higher reality existing outside our senses, especially our sense of sight, not as such an abstract entity as is deemed, i.e., it is a matter of interpretation. For instance, when we are looking at the physical objects which are making their movements along points in space, we cannot fail to be aware or conscious of time passing. (A moving object is deemed as taking a certain amount of time to move from a certain point to a certain point (distance) in a certain direction, whose actual movement could be observed and gauged in terms of time, distance, velocity, force and direction.) If we touch these objects we could feel the force of their movement, or, on the other hand, the force of our movement (along the objects) and this would also give us a sense of time.

To put it another way, time could be interpreted (implying subjectivity) as seeable by the naked eye and sensable by physical touch (in other words, it is a matter of interpretation). But *time* is actually psychological, not physical - it is the *sense*, *consciousness,* or, *idea* (of time passing), which is associated with the movements of physical objects in any, or, simultaneously all, of the three physical dimensions (of length, breadth and height, which are also evidently the result of (subjective) interpretation, an idea derived from renowned French mathematician and philosopher Rene Descarte's invention of the co-ordinate system, a system of describing a physical object's location in space by using three co-ordinates or axes, commonly called the *X, Y, Z* axes, which are in fact the *length, breadth, height* axes; the other possible (subjective) interpretation of the dimensions of space is to regard space as a Hilbert space, as is the case with the scientific treatment of the micro-world of the quantum particles - a Hilbert space is a space with an infinite number of dimensions, which would make the interpretation of the dimensions of space more complicated and more intractable). In particular, time is always associated with the movements of the second, minute and hour needles of

the clock or watch, which measure or gauge the precise passing of time, without which our sense of time or of time passing would be imprecise and vague.

To circumvent the controversy pertaining to whether time is an invention or actually real, time being actually an abstraction which is evidently derived from the movements of objects that could be physically observed or seen (a physical object is deemed, understood, as taking time to move or travel from one location to another location in space, time which could be gauged by a watch or clock) and which is apparently causing some misunderstanding or lack of comprehension, we could describe space as a space-movement continuum or space-vector continuum (which should be visualisable, more evident, more comprehensible, and less controversial) instead of space-time continuum, which are in fact all equivalent; space may also be described as a space-consciousness continuum instead of space-time continuum as time is directly related to both movement and consciousness, being a psychological entity as is described above, with consciousness being also an intangible, abstract entity like time, but this interpretation would be more abstract, and, more problematic, than the space-time continuum (at least, time can be gauged or measured with a clock or watch, whereas there is no way to gauge or measure consciousness). The velocity or speed of movement of an object is derived by gauging the time the object takes to move or travel from one location to another location in space (distance) in terms of units of measurement for distance such as feet, metres or miles per unit of measurement of time such as second, minute or hour. It is evident here that for time (and distance) to be gauged there has first to be movement. We can actually physically observe or see an object move in the length, breadth, height dimensions, axes or co-ordinates, but we can never physically observe or see the object move in the time dimension (though we can mentally or consciously sense it, the movement of the object from location to location in space is known or understood to take time (an abstract, intangible entity) to do so - time being psychological while the dimensions of length, breadth and height are physical). In any case, no one could say movement is not real but an invention of the intellect, unlike the case of time, as movement is physically observable, seeable and thus indisputable (i.e., visualisable), unlike time. We should also bear in mind that movement can be described by, besides time, distance, velocity (units of distance per unit of time), force (amount of mass per unit of acceleration), and direction, which could all be physically measured or gauged, as is stated above. (In vector analysis, movements of objects with directions are depicted with vector diagrams, a vector being a term which describes an object or force moving or traveling in a certain direction.)

Now, back to the important question: Is time real or is it just an invention of the intellect? Time is like beauty and intelligence; they are all very abstract, intangible, and seem unreal. However, we somehow know they are there when we encounter objects or beings endowed with them. But, unfortunately, we cannot physically count or quantify them as we physically count our coins, and, we, e.g., cannot present a bottle of time to a person, we cannot present a bottle of beauty to him, and, we cannot offer him a bottle of intelligence. How nice if we can do so! On the other hand, we can offer a TV set which physically has length, breadth and height to a bored person to provide him entertainment, we can offer a bottle of soft drink to a thirsty person to quench his thirst, and, we can offer a hungry person a packet of food to satisfy his hunger. The purpose of bringing up these examples, and explaining the philosophical logic above, is to really show that we should not confuse the intangible entities such as time, beauty and intelligence with the tangible entities such as a TV set with length, breadth and height, a bottle of soft drink and a packet of food, and treat them all the same, which would create logical problems. Therefore, to avoid such logical problems, the time dimension, which is abstract and intangible, of the space-time continuum should not be confused with and treated the same as the tangible, physical dimensions of length, breadth and height. Is there some other better way to model space? How about a space-gravity or space-graviton continuum, for example? So, is time real? The intellect can consider it real or consider it an invention of the intellect, i.e., not real. It is a matter of interpretation. Both can be acceptable. All this sounds like Einstein explaining the Theory of Special Relativity, isn't it? Bearing in mind that time, which is intangible, is a sort of consciousness or awareness or conception - it is the consciousness or awareness or idea of the period covered by the distance a moving object moved or traveled (i.e., the consciousness or awareness or idea of the time a

moving object took to move or travel from one point to another point in space), if consciousness is real, time is also real. This is yet another interpretation of time, which the author tends to favour.

To really physically travel in the time dimension we have to be able to walk, run, move, travel on time, as we do on the road. Can time be the road for us to physically travel on? All this is absurd. Thus, physical time-travel is absurd. It seems difficult to convince the time-travel die-hards that time-travel is an impossibilty. However, it appears that through ambiguities many have been misled into believing that time-travel is possible. We should bear in mind that Einstein himself had thought that time-travel is not possible. More on time-travel below. The author had in the past been confused by all the mumbo-jumbo about time and time-travel and has here gone to some length to explicate the philosophy of time in order to convince the readers, as well as himself, that physical time-travel is absurd and impossible.

Time-Travel

How nice it is to time-travel back to the happy childhood days, the good times, the memorable events! All time-travel enthusiasts are probably aware of the "grandfather" paradox, i.e., travel back in time to the time of one's grandfather and then kill him so that he will not be able to father one's father, or, mother, and, therefore, oneself will not exist. (Such paradoxes may be construed as *reduction ad absurdum* evidence that physical time-travel is an impossibility.)

When Einstein published the Theory of General Relativity ten years after his Theory of Special Relativity, it brought out the possibility of traveling into the past. Taking the mouths of two wormholes, which are tunnels through space made possible by general relativity, and putting one mouth on a space-ship and flying the space-ship off at close to the velocity of light would introduce a time difference between them due to *time dilation, i.e., the clock slowing down, and, the aging process slowing down in the mouth on the space-ship. The person who jumps into the "future" mouth of the wormhole would emerge from the other mouth in the past. (*Time dilation, which is predicted by Einstein's Theory of Special Relativity, states that a person flying off on a space-ship at close to the velocity of light would return home a short number of years later to find that many years had passed back on Earth. In other words, the space-traveler had jumped into the future.)

However, the technical difficulties of implementing the above scheme are considerable, though some physicists have speculated that it may become possible in the centuries to come.

Is the above phenomenon really time-travel? Let us look at an analogous situation involving, e.g., two 60-year-old men, applying the same "aging", time dilation principle; for instance, one of them ages more slowly due to a better genetic make-up, e.g., he still has a head of black hair and looks 20 years younger, while the other man's hair is all white and he looks his age. Can we say that the younger looking man on meeting the older looking man has jumped into the future? Can we say that the older looking man on meeting the younger looking man has jumped into the past?

Another situation of "time-travel" here. Earth rotates clockwise from east to west, at say, x miles per y second. If John were to travel in the same clockwise direction as Earth's rotation towards the west but at a speed greater than x miles per y second, would he be traveling into the future? If John were to travel in the opposite, anti-clockwise direction towards the east at any speed, would he be traveling into the past?

Are all these time-travels not metaphors, or, illusions? All this is apparently evidence of the inventiveness or creativeness of the contemplating intellect which has been at work (and is apparently subjective).

Conclusion

Hopefully, all the apparent confusion, wooliness and misunderstanding about time and time-travel are straightened out.

References

[1] Concepts Of Modern Physics, Fifth Edition, McGraw-Hill, A. Beiser, 1995

[2] SlipString Drive: String Theory, Gravity, And "Faster Than Light" Travel, iUniverse, Andrew L. Bender, 2006/2007

[3] The Special Theory Of Relativity, Routledge, David Bohm, 1996

[4] The Evolution Of The Physicist's Picture Of Nature, Scientific American, P. A. M. Dirac, May 1963

[5] On The Electrodynamics Of Moving Bodies, Annalen der Physik, 17:891, Albert Einstein, June 30, 1905

[6] The Meaning Of Relativity, Princeton, Albert Einstein, 2005

[7] Faster Than The Speed Of Light: The Story Of A Scientific Speculation, Perseus, Joao Magueijo, 2003

[8] Time Travel In Einstein's Universe, Houghton Mifflin Company, Richard Gott, 2001

[9] A World Without Time: The Forgotten Legacy Of Godel And Einstein, Perseus, Palle Yourgrau, 2006

[10] Modern Physics (4th. ed.), W. H. Freeman Company, Paul Tipler, Ralph Llewellyn, 2002

[11] An Aspect Of The Special Theory Of Relativity, The General Science Journal, Bertrand Wong, March 8, 2010

[12] The Special Theory Of Relativity: A Special View, The General Science Journal, Bertrand Wong, March 8, 2010

[13] The Special Theory Of Relativity: Further Views, The General Science Journal, Bertrand Wong, March 18, 2010