SPECIAL RELATIVITY: PART THREE

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Abstract

This paper probes further into the Special Theory of Relativity.

One of the postulates of the Special Theory of Relativity is that no object could travel at a greater velocity than the velocity of light. However, it should be noted that quantum particles are capable of teleportation or travel to another location instantaneously, which is in effect superluminal or faster than light travel.

The postulates of the Special Theory of Relativity evidently imply that the invariance of the velocity of light at all inertial frames is only an illusion - if the velocity of light were to appear invariant, according to the Theory, lengths have to contract (Lorentz contraction) and clocks have to slow down (time dilation), at the same rate, while traveling at close to the velocity of light. We here ask the important question: If lengths do not contract and clocks do not slow down at close to the velocity of light, as are postulated by the Special Theory of Relativity, would the velocity of light still appear invariant?

In all this, we should also not forget that while the slowing down of clocks (time dilation) when traveling at high velocities is an experimentally proven phenomenon length contraction (Lorentz contraction) has not been experimentally proven and remains an inference - length contraction (Lorentz contraction) might not be an actuality.

In the author's paper, Special Relativity: Part One, it is stated that there is an anomaly relating to length contraction (Lorentz contraction) and the invariance of the velocity of light. Thus, there could be other reason or reasons for the invariance of the velocity of light at all inertial frames, e.g., length expansion, as is described in this earlier paper (as per Item (1) below), or, some other valid reasons. Let us here recapitulate the important point brought up in this earlier paper, which is as follows:-

In order for the velocity of the beam of light to remain/appear invariant, one of the following has to happen:

1) When the clock slows down (time dilation) by *x* %, the ruler should increase in length (length expansion) by *y* %.
2) When the ruler decreases in length (length contraction) by *x* %, the clock

should quicken (time contraction) by *y* %.

3) When the clock slows down (time dilation) by *q* % and the ruler decreases in length (length contraction) by *q* %, the beam of light (moving frame) should slow down by *r* %.

We would add a fourth option to the above three options, which is as follows:

4) When the clock slows down (time dilation) by *q* % and the ruler remains the same in length (unchanged in length) if Lorentz contraction were not an actuality and does not happen, the beam of light (moving frame) should slow down by *s* %. (*s* % < *r* %)

As is stated above, Special Relativity postulates that no moving object could exceed the velocity of light, as at the velocity of light the moving object's mass would be infinite, making further acceleration or increase in velocity of the moving object impossible, while its length would have shrunk to zero - hence the invariance of the velocity of light. Mass is a primitive concept in mechanics. It is assumed to be additive for disjoint bodies. In Newtonian dynamics, it is constant for a given set of particles that may either constitute a body or be discrete. It is normally measured in kilograms. In practice the mass of a body is found by measuring its weight. Formally, mass is a measure; if the set of particles is a body it is required that the measure of the body be absolutely continuous with respect to Lebesgue measure. If length contraction (Lorentz contraction) of a moving object were indeed a true phenomenon (proven by experiment), then at zero length when moving at the velocity of light, as is postulated by the Special Theory of Relativity, the object would have practically disappeared; this is evidently the second reason why no object could exceed the velocity of light - at the velocity of light the object would practically disappear, being zero in length. The object's mass should have also disappeared at the same time, instead of being infinite, as the Special Theory of Relativity has postulated, as mass is linked to size such as length - no body, no size, no mass, and zero length should mean zero mass. The concept of mass is sticky as it is never measured as size such as length, breadth, height, area or volume and only as weight. Matter has mass and it also has size such as length, breadth, height, area or volume. Size - length, breadth, height, area or volume - is related to mass, normally the larger the size, e.g., length, is the larger the mass would be and vice-versa - heavier objects are normally larger in size and vice-versa. Therefore, length contraction (Lorentz contraction) and the increase in mass as per the postulation of the Special Theory of Relativity do not appear to fit together logically. It appears to be an anomaly. So far no one has been able to explain length contraction (Lorentz contraction) though Lorentz himself did try to explain the phenomenon, which is heretofore merely an inference.

On the other hand, length expansion, as in Item (1) above, goes logically well with the increase in mass as the above explanation shows, i.e., the idea that as an object travels at greater and greater velocity approaching the velocity of light its length expands simultaneously together with the increase in its mass makes better sense. But could Item (1) be seriously considered as the solution to the anomaly pertaining to length contraction (Lorentz contraction) and the invariance of the velocity of light as is described in the author's paper, Special Relativity: Part One? Could an object traveling at high velocities possibly increase in length (experience length expansion) and what could cause this to happen?

Since the phenomenon of clocks slowing down (time dilation) while traveling at high velocities had been confirmed by experiments and length contraction has not been confirmed experimentally as yet but is an inference only, Item (2) above (which states clock quickening, an unproven phenomenon and the reverse and contradiction of the experimentally proven clock slowing down phenomenon (time dilation)) could be ruled out, while Items (1), (3) and (4) are possibilities, however remote these possibilities might be. Though the intense gravitational field caused by travel at almost the velocity of light might account for the slowing down of clocks (for which experimental evidence had already been obtained as is stated above) and therefore time, as well as the brain and bodily functions of a person, it evidently hardly suffices as an explanation for length contraction (for which experimental evidence has yet to be found, and, which seems like a "fudge on the figure" by the inventor of the Special Theory of Relativity to "ensure the invariance of the velocity of light").

We should remember that length contraction is after all an unconfirmed inference (unlike time dilation which had been proven by experiments as is stated above). The same would apply to length expansion. There is probably no such things as length contraction or length expansion. It is difficult to envision or imagine a rigid object such as a ruler or metre rod contracting in length or expanding in length as though it is made of rubber, which is flexible, and such a phenomenon should be regarded as improbable; length contraction and length expansion could therefore be regarded as only illusions at most, more apparent than real, like some of the other postulates of the Special Theory of Relativity, which would be described below. Because of this, Items (1) and (3) above would appear remotely probable with Item (2) completely ruled out as is stated above, while Item (4) is most probable. But Item (4) above implies that the velocity of light would appear to exceed the 186,000 miles per second limit (the slowed down clock ("time dilated" clock) and the ruler which remains the same in length (does not contract in length) would now together gauge the velocity of the beam of light (which is actually 186,000 miles per second) as more than 186,000 miles per second - as the clock has slowed down (time dilation), the beam of light would now (appear to) take less time to travel the same distance, i.e., the velocity of the beam of light now appears to be greater, this higher velocity being determined by dividing the distance

traveled by the time taken to travel this distance), 186,000 miles per second being the limit of the velocity of light which is postulated by the Special Theory of Relativity - the velocity of light could never exceed this limit as is postulated by the Theory. Thus, the above is evidently an *illusion* caused by the slowing down of the clock while the length of the ruler remains unchanged (does not contract), both the clock and the ruler having been utilised to gauge the velocity of the beam of light. That is, Item (4) above would produce the *illusion* of the beam of light (which has an actual velocity of 186,000 miles per second) having a velocity of more than 186,000 miles per second. All this would be another "headache" for the Special Theory of Relativity, which states that no moving object including light could exceed the velocity limit of 186,000 miles per second. As is stated in Item (4) above, in order for the slowed down clock (slowed down by *q* % for example) and the ruler whose length has not contracted but remains the same to gauge the velocity of the beam of light as invariant (invariant at 186,000 miles per second), the actual velocity of the beam of light has to be less than 186,000 miles per second (the beam of light should slow down by *s* %, as is stated in Item (4) above); this would of course result in the *illusion* that the velocity of the beam of light is invariant (unchanged at 186,000 miles per second) while the actual velocity of the beam of light is less than 186,000 miles per second - if the clock used to gauge the velocity of the beam of light (which is actually less than 186,000 miles per second, say *d* miles per second) had not slowed down (time dilation) but remained ticking at the same rate, the velocity measured would certainly be less than 186,000 miles per second (which is as stated just above the actual velocity, i.e., *d* miles per second).

However, of the four options above, Items (1), (2), (3) and (4), Item (4) is hence evidently the most realistic and probable. We recapitulate here: Item (4) states that there is time dilation but no length contraction, i.e., clocks would slow down at high velocities, e.g., velocities close to the velocity of light, but at such high velocities rulers would not contract in length in the direction of motion and would remain the same in length. Based on these conditions of Item (4), there is a logical, more sensible explanation for the invariance of the velocity of light, which would be described shortly.

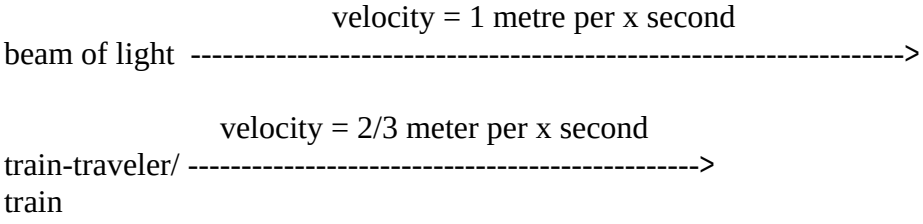
First, the fact that the velocity of light would be invariant if gauged from different inertial frames, e.g., when the velocity is gauged when the beam of light is emitted from a source which is stationary (not moving), for instance, the headlight of a stationary car, and, when the velocity is gauged when the beam of light is emitted from a source which is moving, for instance, the headlight of a moving car - in both these instances the velocity of the beam of light would be the same, as is postulated by the Special Theory of Relativity, though common sense dictates that in the second instance, the instance of the moving car, the velocity of the beam of light should be the velocity of the beam of light (186,000 miles per second) plus the velocity of the car (say 0.014 miles per second), giving a total velocity of 186,000.014 miles per second. The answer to this abnormality, according to the Special Theory of Relativity, is that the beam of light is independent of its source, the car headlight,

and is not affected by this source. This implies that if the car were to travel at a higher velocity than the velocity of the beam of light the car would be moving in front of the beam of light, while the beam of light would be tagging behind the car. (This phenomenon is also described in the author's paper, Special Relativity: Part Two.)

Second, a person on a moving vehicle, e.g., a very fast moving train (moving frame), traveling at close to the velocity of a beam of light (moving frame) in the same direction would find the velocity of the beam of light (moving frame) to be invariant at 186,000 miles per second, instead of the difference between the velocity of the very fast moving train (moving frame) and the velocity of the beam of light (moving frame), which would normally be the case. This is because, according to the Special Theory of Relativity, on the very fast moving train (moving frame) approaching the velocity of light the clock therein used to gauge the time traveled by the beam of light (moving frame) has slowed down by the same degree (say X %) as the ruler or measuring device (stated as meter stick or measuring rod in some texts) therein used to gauge the distance traveled by the beam of light (moving frame) has contracted in length in the direction of the very fast moving train's motion (also X %), the greater the very fast moving train's traveling velocity the more the clock slows down and the greater the length contraction of the ruler or measuring device. This is expressed in the following equation (the velocity of the beam of light (moving frame) being the distance it traveled divided by the time it took to travel this distance), which is in accordance with the Special Theory of Relativity:-

(186,000 miles - X % of 186,000 miles) ÷ (1 second - X % of 1 second) = 186,000 miles per second

The explanation in this second case for the invariance of the velocity of light is based on the conditions stipulated in Item (3) above, wherein length contraction is evidently not so probable, as is explained above. Also, to have length contraction and time dilation happen to the same degree (shown in the above equation as X % each) is not that probable. (The author's earlier paper, Special Relativity: Part Two, has commented on this.) We would re-construe this second case using the more realistic and probable conditions stated in Item (4) above, namely, time dilation, which is a proven phenomenon, and absence of length contraction, which is to be expected. We would use a simple diagram to explain, which is as follows:-



The above train-traveler traveling at two-third the velocity of light besides a beam of light in the same direction is gauging the velocity of the beam of light. The velocity of the beam of light is 1 metre per x second while the velocity of the train, being two-third the velocity of light, is 2/3 metre per x second. Under normal circumstances, the train-traveler would gauge the velocity of the beam of light traveling in the same direction besides his train as 1/3 metre per x second, obtained by deducting the velocity of the train from the velocity of the beam of light, i.e., 1 metre per x second minus 2/3 metre per x second. But, the train-traveler is now experiencing some abnormal conditions while traveling at two-third the velocity of light, i.e., 2/3 metre per x second, as, by Item (4) above, his clock slows down while his ruler or measuring rod remains unchanged in length (does not experience length contraction). Say, e.g., the train-traveler's clock has slowed down by two-third while his ruler or measuring rod remains the same in length, while traveling at two-third the velocity of light, or, 2/3 metre per x second. The train-traveler's unchanged ruler or measuring rod would now gauge 1/3 metre (the velocity of the beam of light should be 1/3 metre per x second under normal circumstances as is stated above) as 1/3 metre still but his clock which has slowed down by two-third would now gauge the time taken to travel the distance of 1/3 metre as 1/3 x second (and not x second), i.e., the train-traveler would now gauge the velocity of the beam of light traveling in the same direction besides his train as 1/3 metre per 1/3 x second, which is the same as 1 metre per x second, which is the velocity of light! Thus, to the train-traveler, the velocity of the beam of light traveling in the same direction besides his train is invariant, i.e., still 1 metre per x second, instead of 1/3 metre per x second. Therefore, the conditions of Item (4) above, namely time dilation and absence of length contraction, could be incorporated into a revised Special Theory of Relativity, whereby the anomalies described in the author's earlier papers, Special Relativity: Part One, and, Special Relativity: Part Two, would be gone.

We have to find a fool-proof reason or reasons to explain why the velocity of light always appears invariant at all inertial frames. If not, the invariance of the velocity of light would be subject to doubt. In the light of the above, we should query whether the invariance of the velocity of light postulated by the Special Theory of Relativity is *real* or just an *illusion*. In fact, there are some well-respected scientists who think that the velocity of light is variable, with one well-respected UK based scientist entertaining the idea that the velocity of light

has varied with the evolution of the universe, exceeding 186,000 miles per second at certain points of time.

On the one hand, there had been quite some evidence which prove that the velocity of light is invariant, e.g., the famous Michelson-Morley experiments. On the other hand, this important tenet of Special Relativity has its contradictions or weaknesses. It is a confusing state of affairs and we find many admirers as well as detractors of Special Relativity. In view of all the above-described, including the postulates of the Special Theory of Relativity, the velocity of a beam of light could be regarded as “relative” and “variable”, depending on how the measuring devices such as the clock and the ruler “behave”. The velocity of a beam of light could be interpreted as having two aspects: (i) the velocity measured by a clock and a ruler before time dilation and/or Lorentz contraction, (ii) the velocity measured by a clock and a ruler after time dilation and/or Lorentz contraction; i.e., there are two different ways of interpreting the same velocity of the beam of light.

However, a close scrutiny of the Special Theory of Relativity should make one realise that it is a “theory of illusions”. Concepts in the Theory such as simultaneity, i.e., what events appear simultaneous to one observer at one inertial frame might not appear simultaneous to another observer at another inertial frame, length contraction and time-dilation wherein an observer on the ground level (stationary frame) and an observer on a moving vehicle traveling at close to the velocity of light (moving frame) see one another’s rulers and clocks contract in length and slow down respectively by the same degree, and, a person on a moving vehicle (moving frame) regarding himself as stationary and regarding the person on the ground level (stationary frame) as mobile, seem to be, honestly speaking, artificial. All these parties are each right in thinking the way they do, according to Special Relativity. That is, all of them are right in their thinking and no one is wrong - there is more than one reality. The invariance of the velocity of light might indeed be a true phenomenon but the explanation of this phenomenon a la the Special Theory of Relativity seems quite far-fetched. Isn’t it so? For example, could we say that the law-abiding citizen is doing the correct thing by abiding by the law and the person who breaks the law, e.g., by robbing or murdering, is also doing the correct thing by breaking the law? Could we say that the person who describes a red object as red in colour and the person, perhaps colour-blind, who describes the red object as green in colour are both right? Is more than one standard or reality acceptable? Isn’t all this incredible? Special Relativity appears to “preach” something like that.

The Special Theory of Relativity by postulating that the velocity of light is invariant due to clocks slowing down (time dilation) and length contraction (Lorentz contraction), each at the same rate as the other, evidently implies that without these two phenomena the velocity of light would not appear invariant; all this actually amounts to manipulating data to make

the velocity of light appear invariant. Thus the invariance of the velocity of light, as is described by the Special Theory of Relativity, is evidently just an illusion.

We ask an important question: Couldn’t the velocity of light be invariant without involving time dilation and Lorentz contraction? This invariance would then be indisputable.

The invariance of the velocity of light might seem as mysterious, puzzling and inexplicable as “quantum weirdness”.

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